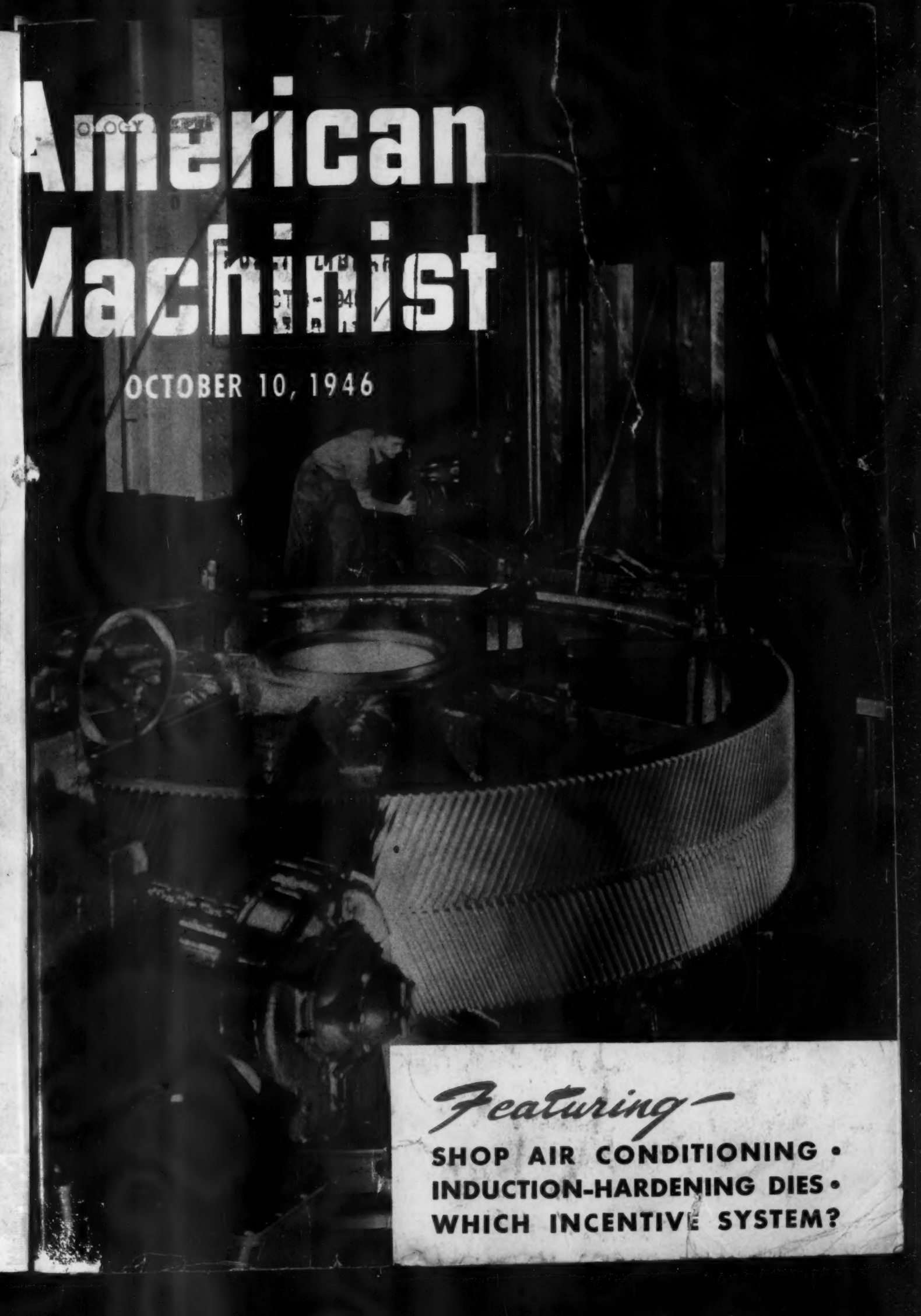
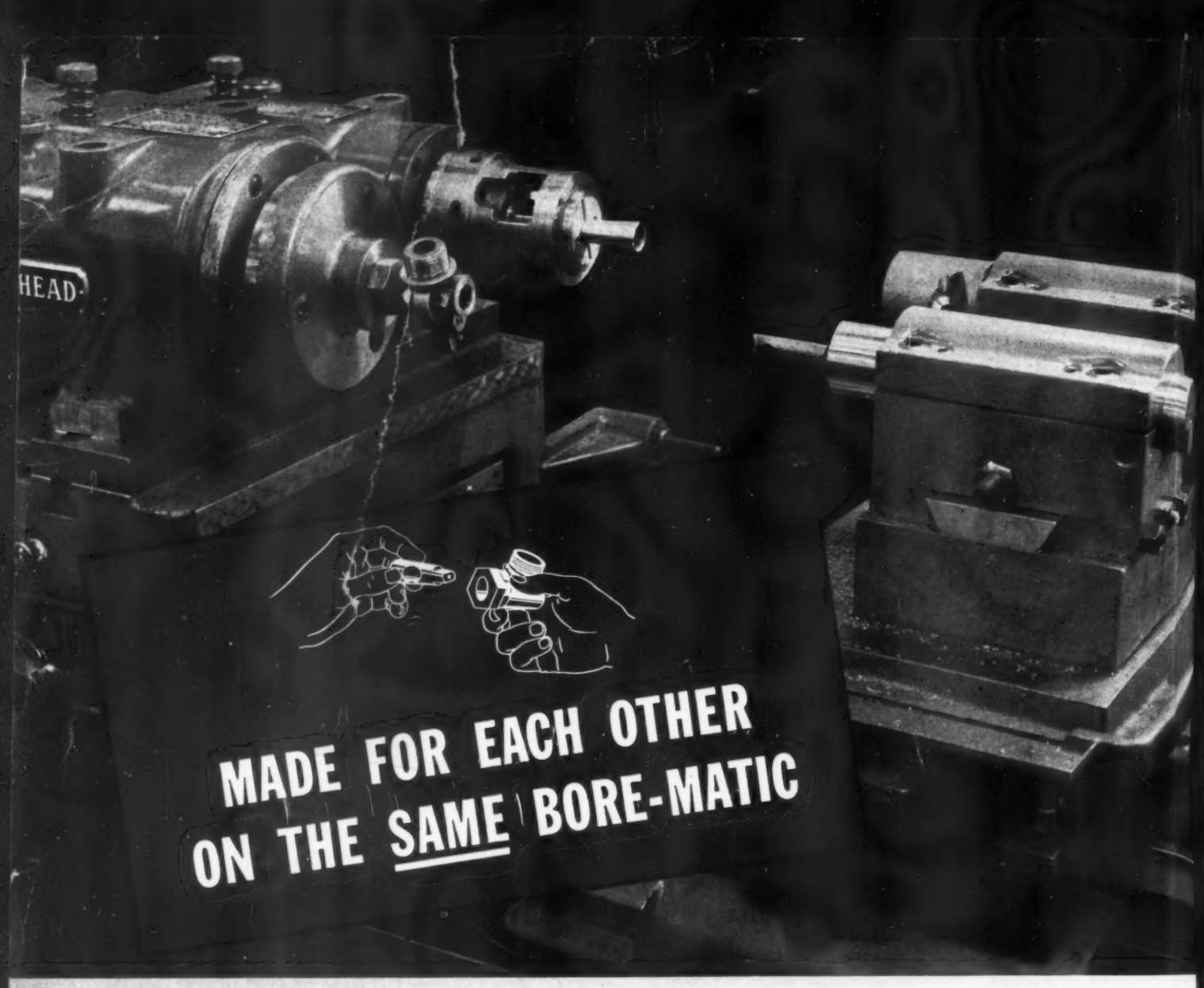


American Machinist

OCTOBER 10, 1946

Featuring—

SHOP AIR CONDITIONING •
INDUCTION-HARDENING DIES •
WHICH INCENTIVE SYSTEM?



Here's how Heald gives you automatic accuracy in precision-fitted parts... borized on the same machine, at the same time.

In any machining operation involving precision-fitted parts, you get faster, surer, more economical results when you borize *mating* parts on the *same* Heald Bore-Matic . . . at the *same* time. For borizing is a finishing operation in itself, in most cases eliminating need for extra lapping. Accuracy is automatic, without possibility of error — all like parts come out twins, and every pair of opposite parts fits together perfectly.

In machining valve bodies and plugs, for example, one manufacturer was troubled with irregular production and a great deal of extra finishing. Heald engineers tooled up the Bore-Matic shown above, to bore bodies and turn plugs *simultaneously*. Result: balanced production of parts . . . negligible rejects . . . lower tool costs with cemented carbide boring tools. And all valve parts are completely interchangeable, eliminating the re-machining and selective assembly previously required.

Cost savings like these are possible with every Precision Grinder or Bore-Matic in the Heald line. If you want closer control over your machining operations, with a higher rate of production at a lower cost per part, there is a Heald machine to do the job, and a staff of 200 Heald engineers to give you friendly, expert advice. For further information, write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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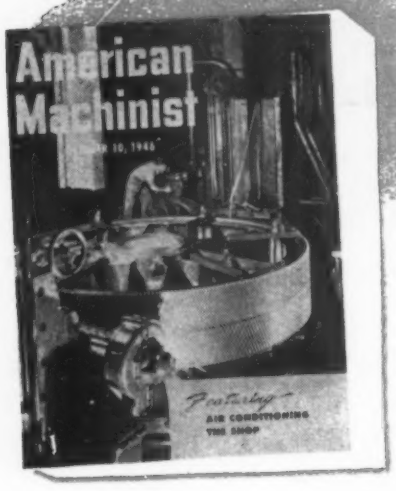


Chips and QUIPS

Mine, but Russia's . . . A 14-ft. dia., 30-in. face herringbone gear nears completion at the Milwaukee plant of Falk Corp. It will go to Russia for a mine hoist. The machine can hob gears up to 30-ft. dia., is a special built by Falk. The left head hobs from the bottom, the right from the top. Kodachrome by M. Hans Zielke.

Progress . . . Hardening anything as long as a bending-brake die is a tricky operation at best. Dreis & Krump has a new wrinkle—induction hardening progressively, by a method fairly similar to that used by Monarch in hardening lathe screws (*AM* cover, April 25). Details are in our lead article.

Juxtaposition . . . One publishing nightmare is the possibility that two facing pages will disagree, compete or "read across." When it happens in advertising, there are loud repercussions. When it happens in editorial sections, it is frequently not nice. But we had a nice one Aug. 29—which you may have noticed. On the right-hand page was a 2-color head, "Lighting for Production," covering that 16-page special report. Facing it was a belligerent old gent, with the headline, "Old Man Jonas Looks On—and Doesn't Like It." His eyes must be unusually good.

Further Incentive . . . So many readers liked our special report on Wage Incentives (*AM*, Jan. 3) including the judges of the Annual Competition for Editorial Excellence (praise be) that we've been in search of suitable supplements. A shorty showing faults appeared in Sept. 26; now we've got a longer article on the subject by an authority, Prof. H. Barrett Rogers of Northwestern University . . . The supplement idea is, incidentally, fundamental with us. A special report provides a solid base for understanding, surveys current practice, provides an outline. Then we add progress reports as time goes on—witness the recent articles on lubrication, materials handling, stainless steel, etc.

Automaticity Again . . . Dodge has evolved an automatic spray-painting setup for bodies, fenders and parts, controlled by one operator and quite flexible to suit color changes. Rupert Le Grand adds this third part to his Detroit chronicle.

Nazi Ghost . . . Junkers Aircraft developed a special method of pressure-welding aluminum alloys in order to produce cooler elements for the Jumo engine on the Junkers 88. We have abstracted the translation of the technical description in this issue.

Air Conditioning . . . War brought extensive installations of air conditioning in Metalworking, and a new appreciation of its potentialities. We've talked the whole thing out with manufacturers and users, have in this issue a 16-page summary that will help you decide what it can do for you. As usual, reprints will be available on request at a dime a copy.

Coming . . . At this writing, Oct. 24 looks like an assemblage of "must" reading, so reserve some time. We expect to start with the whys and wherefores of decentralizing the machine shop in a metalworking plant, include a description of the dynamometer for testing Dodge engines. There are five fact-jammed pages on selecting carbide cutters, five more on forming thin metal by Wallace C. Mills (with detailed sketches), three on development of large surface plates, another three on safety. These with Shop Shots, the concluding installment of Dr. Truedsson's series on machine tools of tomorrow, and John Straub's ideas on compression as a cause of fatigue failure, should keep you busy. There will also be of course, all the regular departments too.

INCENTIVES AUTHORITY . . . H. Barrett Rogers, professor of Industrial Management, School of Commerce, Northwestern University, has specialized in factory management and production since 1929, particularly wage administration including incentives, time study, standardization, job evaluation and merit rating.

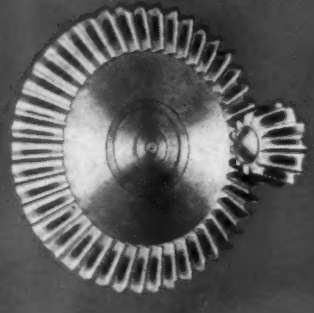
An Illinois farm boy, Professor Rogers worked his way through the University of Minnesota to a degree in electrical engineering, had two years of apprenticeship at Westinghouse, followed by a year as time standards engineer each at Westinghouse, Western Electric and Westinghouse Electric Elevator, in the latter case becoming supervisor. Four years as a professor at Purdue and four at Northwestern complete the record. He is a member of several management associations, the S.P.E.E. and the American Economic Assn., and the author of numerous papers and reports on his specialty.

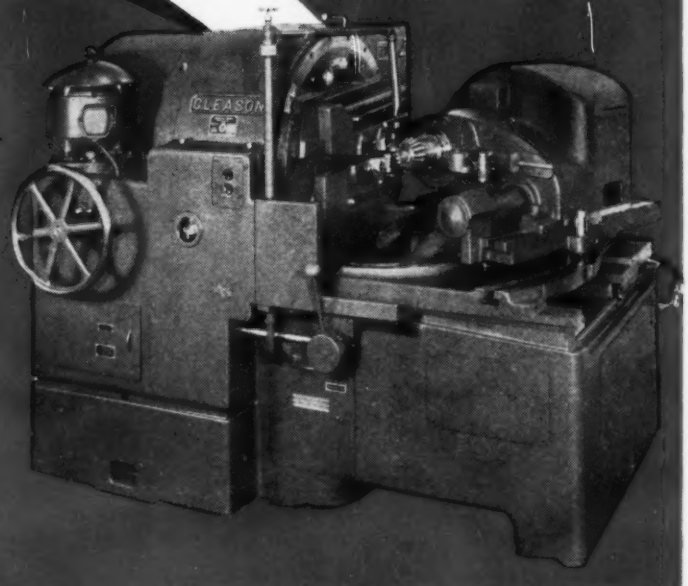
PRODUCE CONIFLEX* GEARS FOR

1. Wider operating tolerances—allowing slight deflections in operation without dangerous concentration of the load at the ends of the teeth.
2. Smoother quieter operation—localization of tooth contact in Coniflex gears assures a good tooth bearing under operating loads.
3. Easier assembling—slight amounts of adjustment are allowable in assembly.

GLEASON
12″ B STRAIGHT
BEVEL GENERATOR

Write for information on this development to produce the latest in straight bevel gears...the Coniflex* gear...positive advance of the tool slides through cam action at each end of the cutting stroke relieves the ends of the gear teeth resulting in a localized tooth bearing.





***CONIFLEX—THE BEVEL GEAR WITH LOCALIZED TOOTH BEARING**

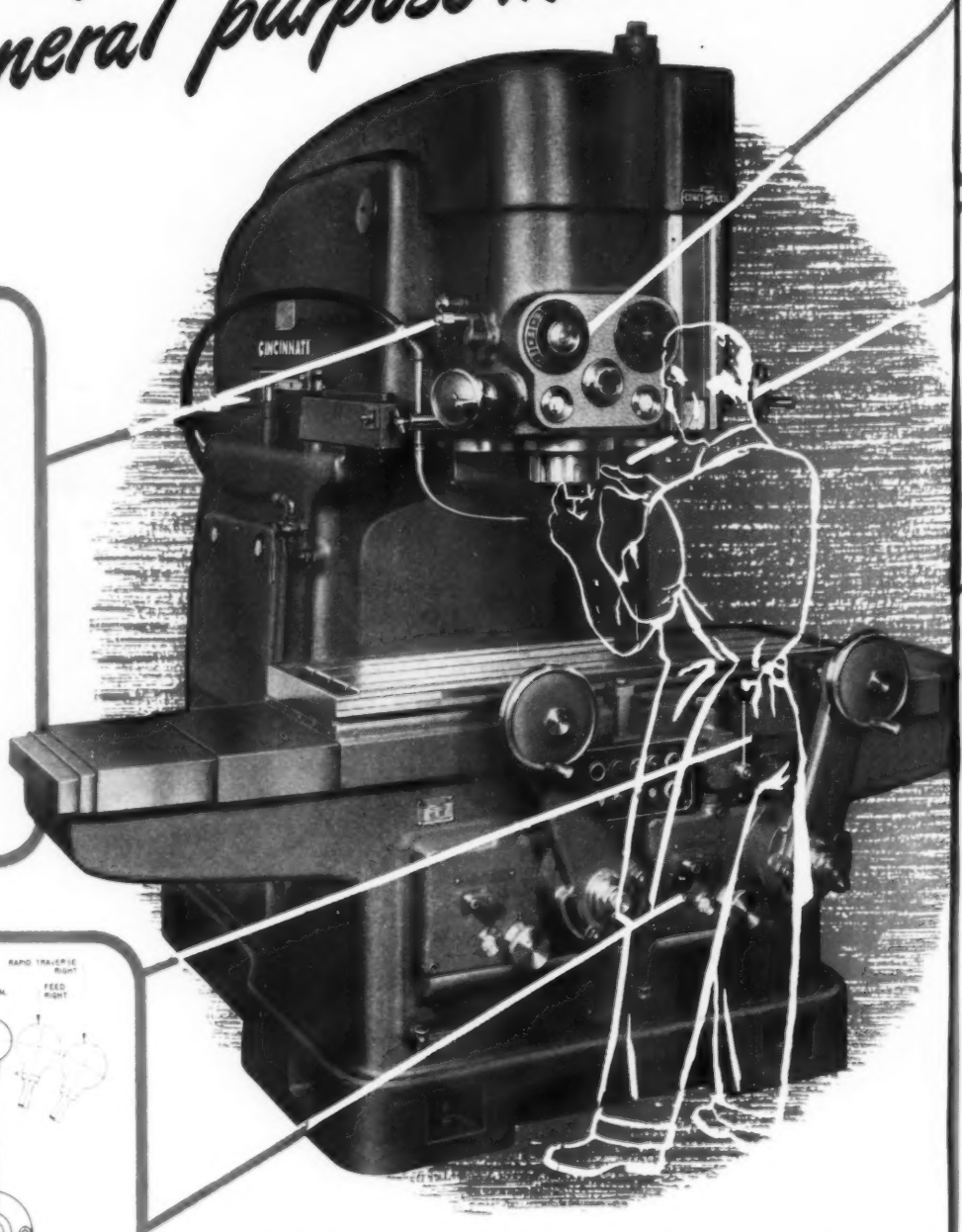
GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over 80 Years

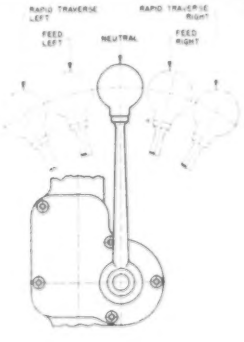
NEW CINCINNATI HYDRO-TEL has everything you need in a general purpose miller!

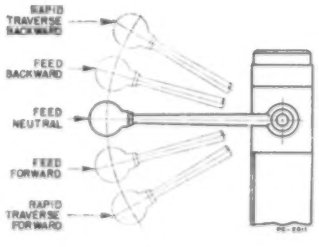
Quick selection of spindle speeds. Selected by rotation of a single crank, easily reached while standing at the front of the machine. One rotation of crank changes speed one increment.

Easy and quick selection of feeds, through dial controls, while standing in the operating position at the front of the machine.



Five position levers for table (right) and cross traverse (below) offer quick movements for both setting up and operating the machine ... power rapid traverse to table and cross slide at the rate of 120 inches per minute.

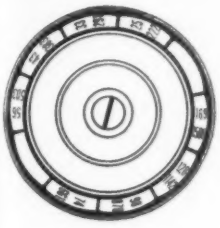




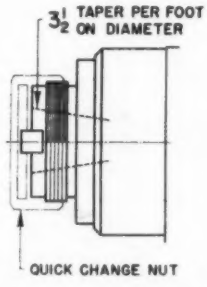
CINCINNATI 16" Vertical Hydro-Tel for general purpose milling. Mechanical and electrical controls can all be reached from operator's working position without walking or stretching.

THE CINCINNATI M

MILLING MACHINES

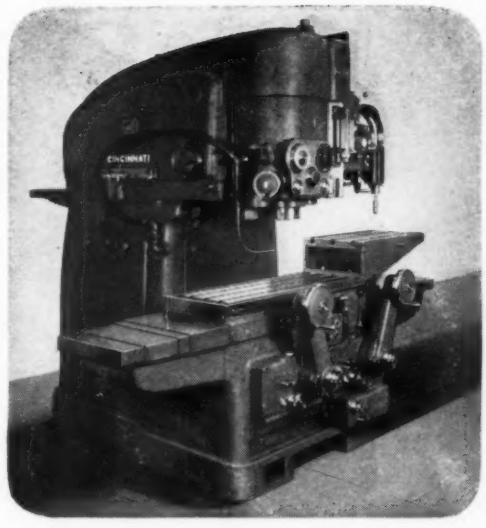


Wide range of spindle speeds . . . 16 speeds, 25 to 1500 or 33 to 2000 r.p.m.; 60 to 1 ratio.



The spindle nose incorporates a quick change feature . . . you can change cutters in 20 seconds or less.

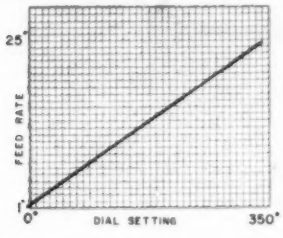
CINCINNATI

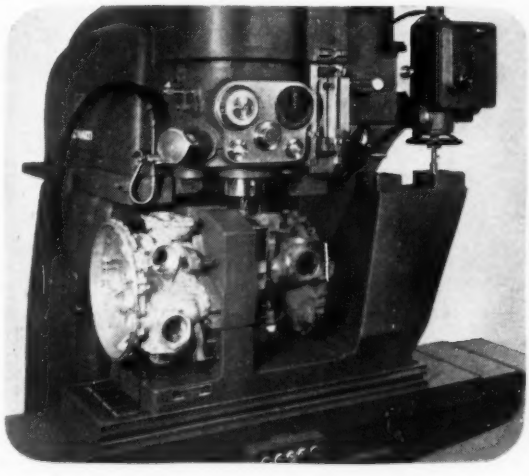


CINCINNATI 16" Vertical Hydro-Tel Die-Sinker with Automatic Depth Control Unit

The operator's hand, thoroughly relaxed, exerts only a few ounces of effort to move hundreds of pounds in the table and cross slide units through Servo hydraulic control. (Right- and left-hand handwheels respectively).

Wide range of feeds to table and cross slide, independent of each other, 1" to 25" per minute, infinitely variable, selected by dial control.





CINCINNATI 16" Vertical Hydro-Tel with automatic 360° profiling unit

Regardless of how you may rate the importance of features in a general purpose miller, there are a few basic considerations around which an efficient machine must be designed. In the new CINCINNATI 16" Vertical Hydro-Tel Milling Machine you will not only find all these fundamental requirements, but many additional features . . . in fact so many, a recent purchaser remarked: "It's the best vertical milling machine on the market." ¶The illustrations on these two pages show some of the ways in which the new 16" Vertical Hydro-Tel fulfills the primary requisites of a general purpose miller. It is rigidly constructed and powered to take a healthy cut. The bed and column are cast in one piece, box section, which means no deflection under cutting stresses. Further, you have the assurance of accurately milled surfaces throughout the entire range of power feed traverse, because the machine has ample support for table and cross slide. Built-in leveling jacks also contribute to accuracy. ¶The new CINCINNATI 16" Vertical Hydro-Tel is available in three styles: 1) general purpose milling; 2) die-sinking; 3) 360° profiling. Complete information may be obtained by writing for new catalog M-1497. A brief description will be found in Sweet's Catalog File for Mechanical Industries.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Extreme

Photograph courtesy HYTRON RADIO AND ELECTRONICS CORPORATION

SHADOW

Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.

Precision

The extreme precision required in the manufacture of radio tube components demands exacting control. The most modern inspection methods must be used.

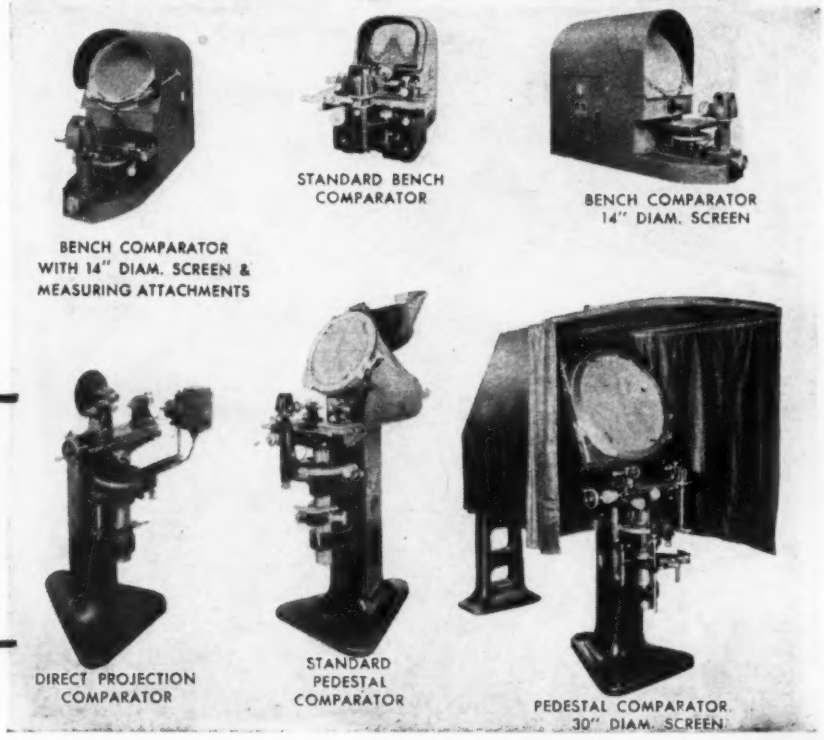
Jones & Lamson Optical Comparators are used to measure the dimensions and orientations of the punched holes in radio tube micas to tolerances of .0001", easily and rapidly. Many other components are also inspected by this method—plates, shields, leads, cathode sleeves, radiators, grids, and filament springs. By any other method, inspection would be a slow and tedious business and the inspection department a costly bottleneck.

Our engineers are inspection specialists, their knowledge of holding fixtures, handling methods and suitable Comparator equipment has saved thousands of dollars in manufacturing plants throughout the country. Call, write or wire for their service today.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.



BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS

STANDARD BENCH COMPARATOR

BENCH COMPARATOR 14" DIAM. SCREEN

DIRECT PROJECTION COMPARATOR

STANDARD PEDESTAL COMPARATOR

PEDESTAL COMPARATOR. 30" DIAM. SCREEN

Balanced Gear Production

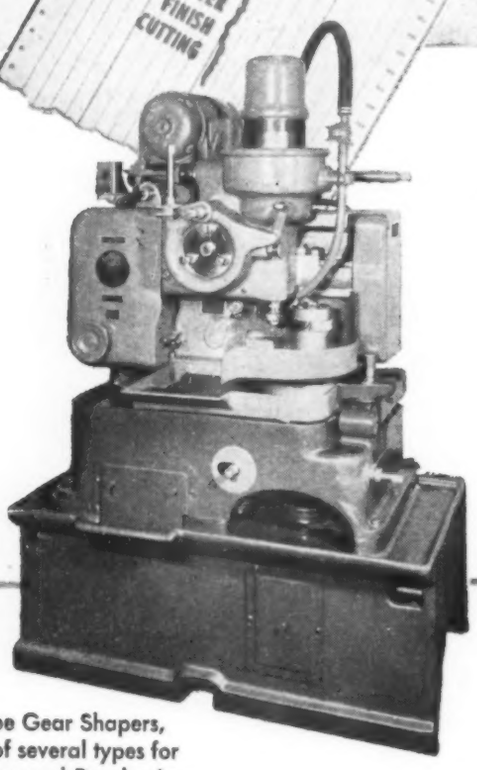
FROM BLANK TO FINISHED

● Gear Shaper accuracy in pre-shaving saves on overall costs, as it holds to limits which increase the life of ultra-precise shaving tools. ● The rapid finishing of gear teeth on the Fellows Gear Shaving Machine maintains a high degree of precision with correspondingly smooth finish. ● Involute profiles and profile modifications can be checked and recorded at all stages on the Fellows Involute Measuring Instrument. Valuable time is saved by its simplicity—no base rolls, sine bars or calculations. ● After hardening, the Fellows Lapping Machine provides an economical means of restoring original

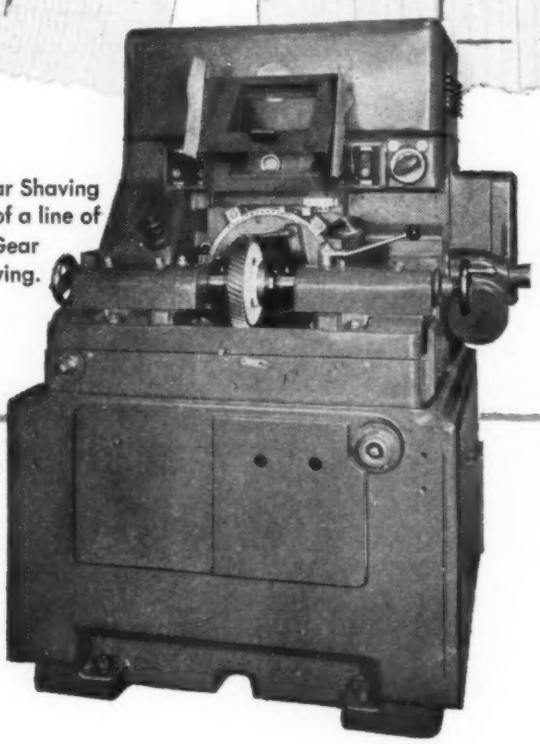
GEAR, AFTER FINISH CUTTING

INVOLUTE, AFTER FINISH CUTTING

GEAR, AFTER SHAVING



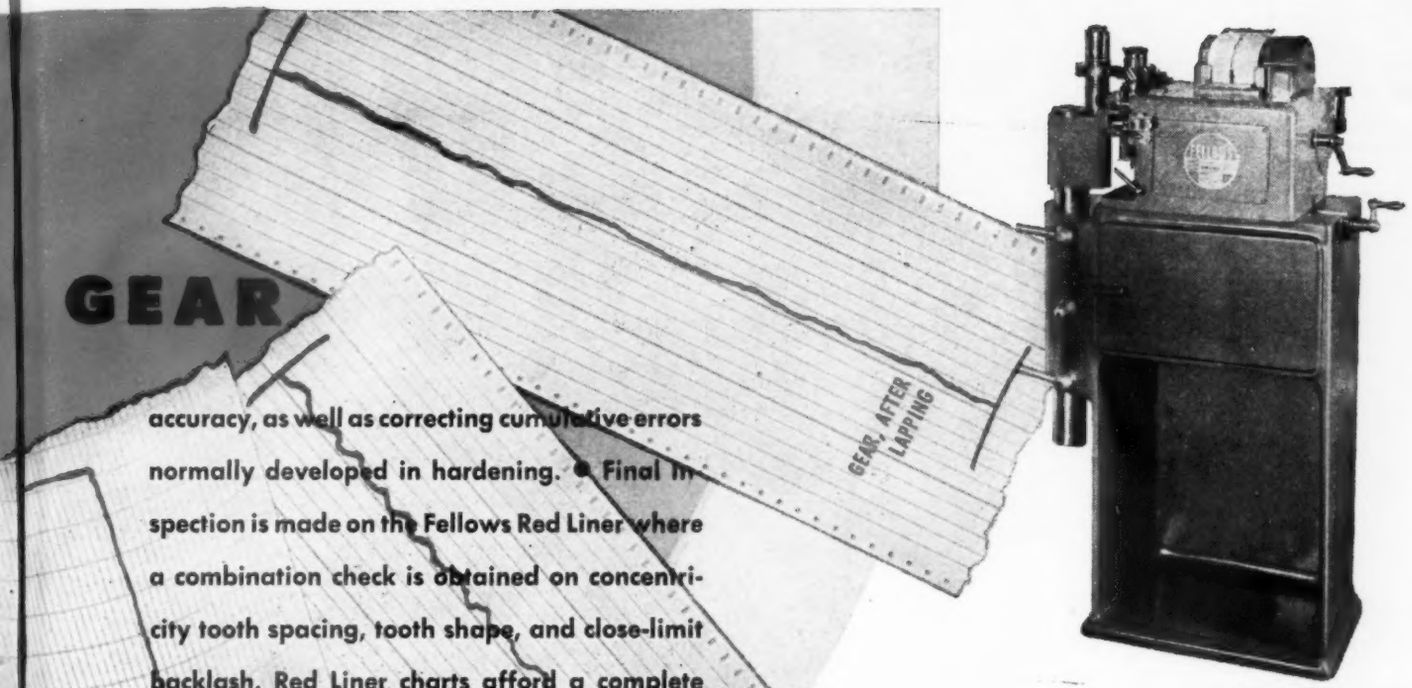
7-Type Gear Shapers, one of several types for Cutting and Pre-shaving.



No. 12 Gear Shaving Machine; one of a line of machines for Gear Shaving.

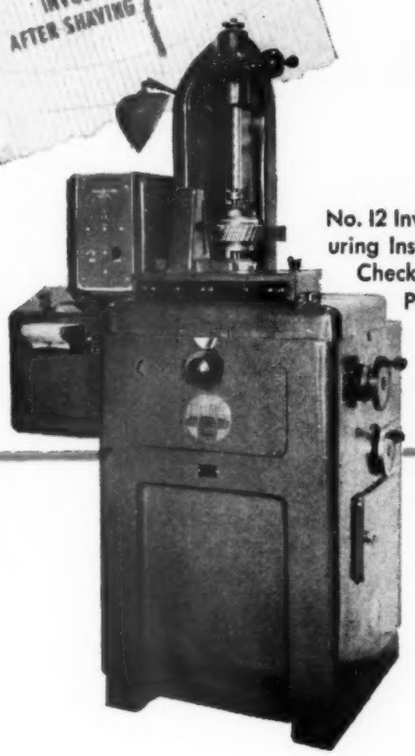
GEAR

accuracy, as well as correcting cumulative errors normally developed in hardening. ● Final inspection is made on the Fellows Red Liner where a combination check is obtained on concentricity tooth spacing, tooth shape, and close-limit backlash. Red Liner charts afford a complete inspection record. ● Thus the Fellows Method controls high production accuracy from blank to finished gear. Consult the Fellows sales engineer on your production problem or write to: The Fellows Gear Shaper Co., Springfield, Vt. or 616 Fisher Bldg., Detroit 2, Mich. or 640 West Town Office Bldg., Chicago 12, Ill.



8M Red Liner for Final Inspection.

LS-Type Gear Lapping Machines for Finishing After Hardening.



No. 12 Involute Measuring Instrument for Checking Involute Profiles.

Fellows

CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Capacity 1/16" to 3½" diameter. Catalog G-456-3

CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Capacity up to 6" diameter. Catalog G-438-3

CINCINNATI FILMATIC No. 4 Centerless Grinding Machine. Capacity up to 9" diameter. Catalog G-3506

WHATEVER THE SIZE OR

a CINCINNATI will

CINCINNATI

CENTER TYPE GRINDING MACHINES

Grinding the bearing diameter of lever studs for movie cameras. These parts are only ¼" long. Production: 300 parts per hour, using the infeed method, on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

CINCINNATI

Grinding the ends of a rear axle housing. The machine is a CINCINNATI FILMATIC No. 3 Centerless Grinder equipped with Outboard Roller Work Rest designed to suit the job.

SHAPE OF THE PART

FILMATIC *Centerless*

grind it!

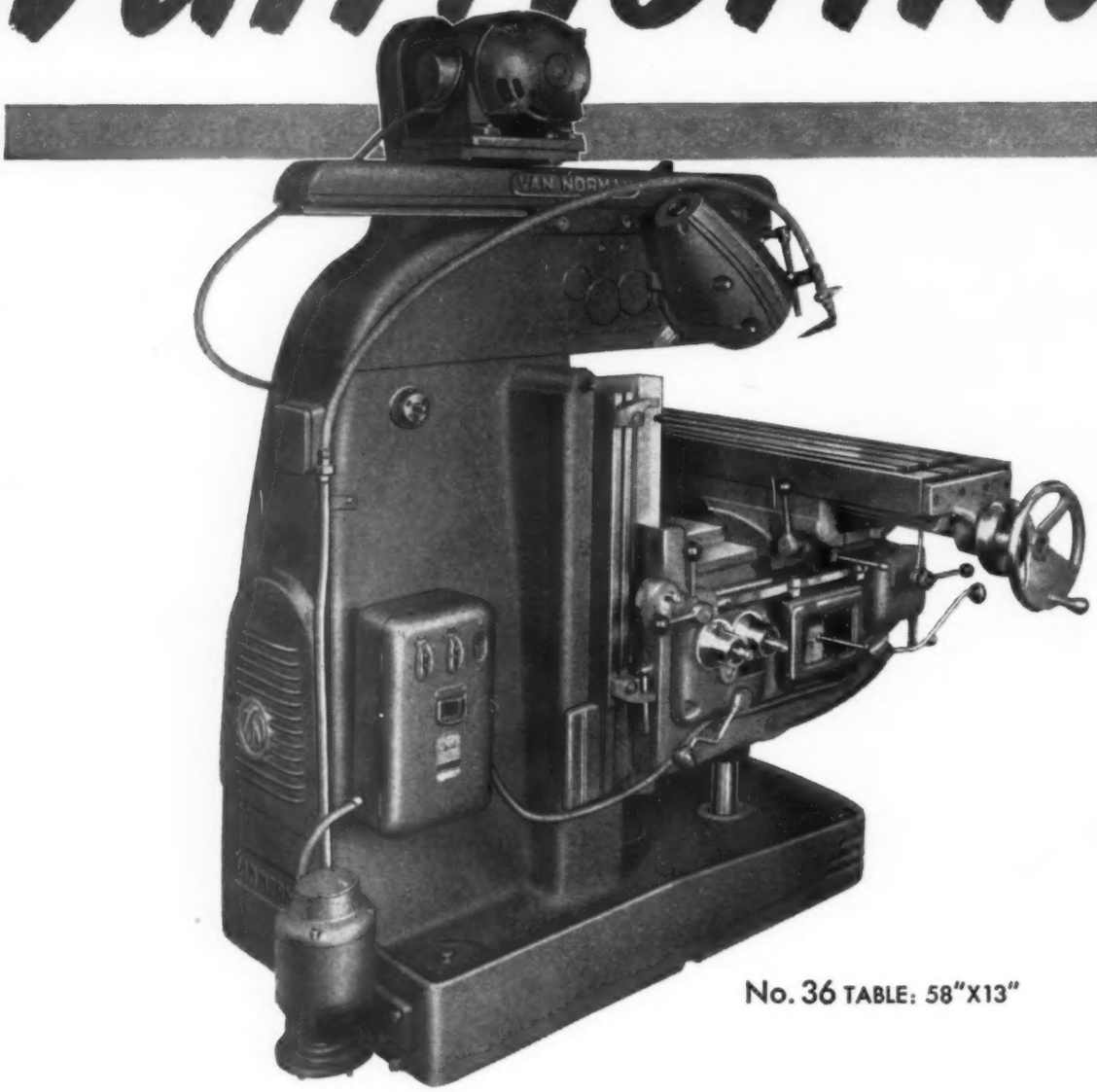
Here you have visual proof of the range of CINCINNATI FILMATIC Centerless Grinding Machines. They grind quickly and accurately parts weighing from a fraction of an ounce and so small you could hold scores of them in the palm of your hand, to large, oddly shaped parts weighing several hundred pounds. These machines are so versatile they will grind a needle, a bowling ball, a banjo axle housing . . . yes, almost anything irrespective of size, shape or material. Cincinnati Engineers are constantly developing new applications involving the centerless method. Talk over with them your grinding operations and get the benefit of their more than twenty years' experience. ¶CINCINNATI FILMATIC Centerless Grinders are made in three standard sizes, Nos. 2, 3 and 4. Larger and smaller sizes are also available. When writing for catalogs be sure to mention the number indicated under the illustrations on the opposite page.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman



No. 36 TABLE: 58"X13"

Manufacturers in all types of industries step up milling production, minimize errors and cut costs per man- and machine-hour with Van Norman Ram Type Millers.

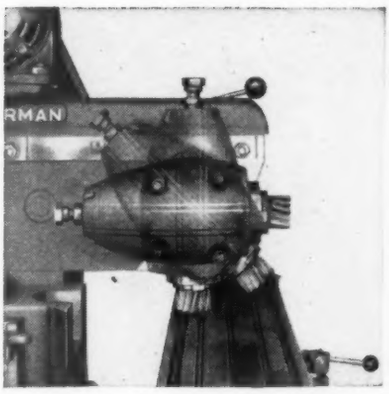
These versatile machines meet daily fluctuating milling requirements by enabling operators to perform horizontal, angular, or vertical milling, all with one machine. In addition, Van Norman Ram Type Millers cut idle operator and machine time as well as improve accuracy because most jobs can be carried through to completion in the original set-up. Other Van Norman advantages include front and rear *directional* control of all power feeds as well as six way rapid traverse, single lever feed selector, front and rear manual controls, heavy construction, massive cutterheads, anti-friction bearings and automatic lubrication.

See for yourself how these machines cut costs, improve accuracy and increase production in the toolroom, machine shop, experimental laboratory and pattern shop. Write: Van Norman Company, Springfield 7, Massachusetts.

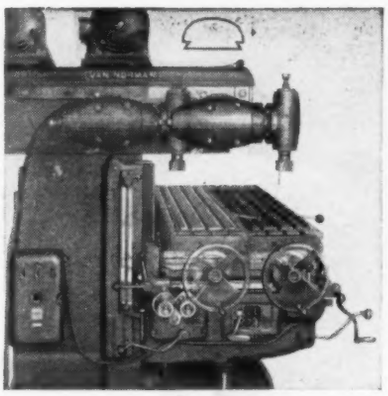
RAM TYPE MILLERS

Meet Job to Job Requirements

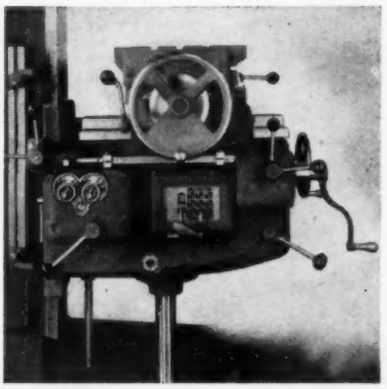
Cut Idle Machine Time Up to 50%



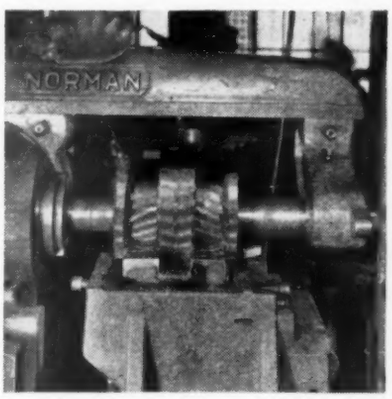
Adjustable cutterhead permits vertical, horizontal or angular milling . . . gives the work range of several single-purpose machines.



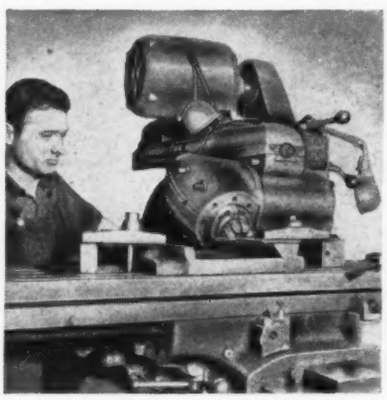
Adjustable cutterhead and movable ram in combination with the saddle crossfeed provide maximum versatility. (Subhead mounted on cutterhead.)



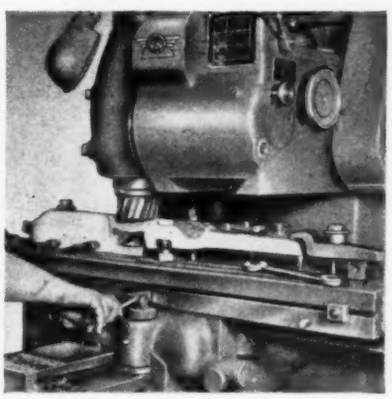
Front and rear control of hand and power feeds give complete visibility and control of operations from either location. Reduces worker fatigue.



Horizontal milling setup. The ram-type overarm with dovetail ways and outer support assures rigidity and accuracy.



With head locked in angular position the operator is taking an angular cut and operates the miller with rear controls.



The ram-type miller used with adjustable cutterhead in the vertical milling position . . . operator using front controls.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It Pays to Van Normanize"

THE MACHINE AND

LANDIS
REG. U.S. TRADE—MARK PAT. OFF.

The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS

LANDIS

LANDIS 3/8 INCH HIGH SPEED THREADING IS PROVIDING NEW PRODUCTION EFFICIENCY ECONOMY FOR SMALL PARTS MANUFACTURERS

Manufacturers of small aircraft parts and other threaded components find the 3/8" LANDIS High Speed Threading Machine ideal for handling this work. The high spindle speeds and simplicity of operation, with one lever controlling both the movements of the carriage and the opening of the grips, assure unusual production possibilities.

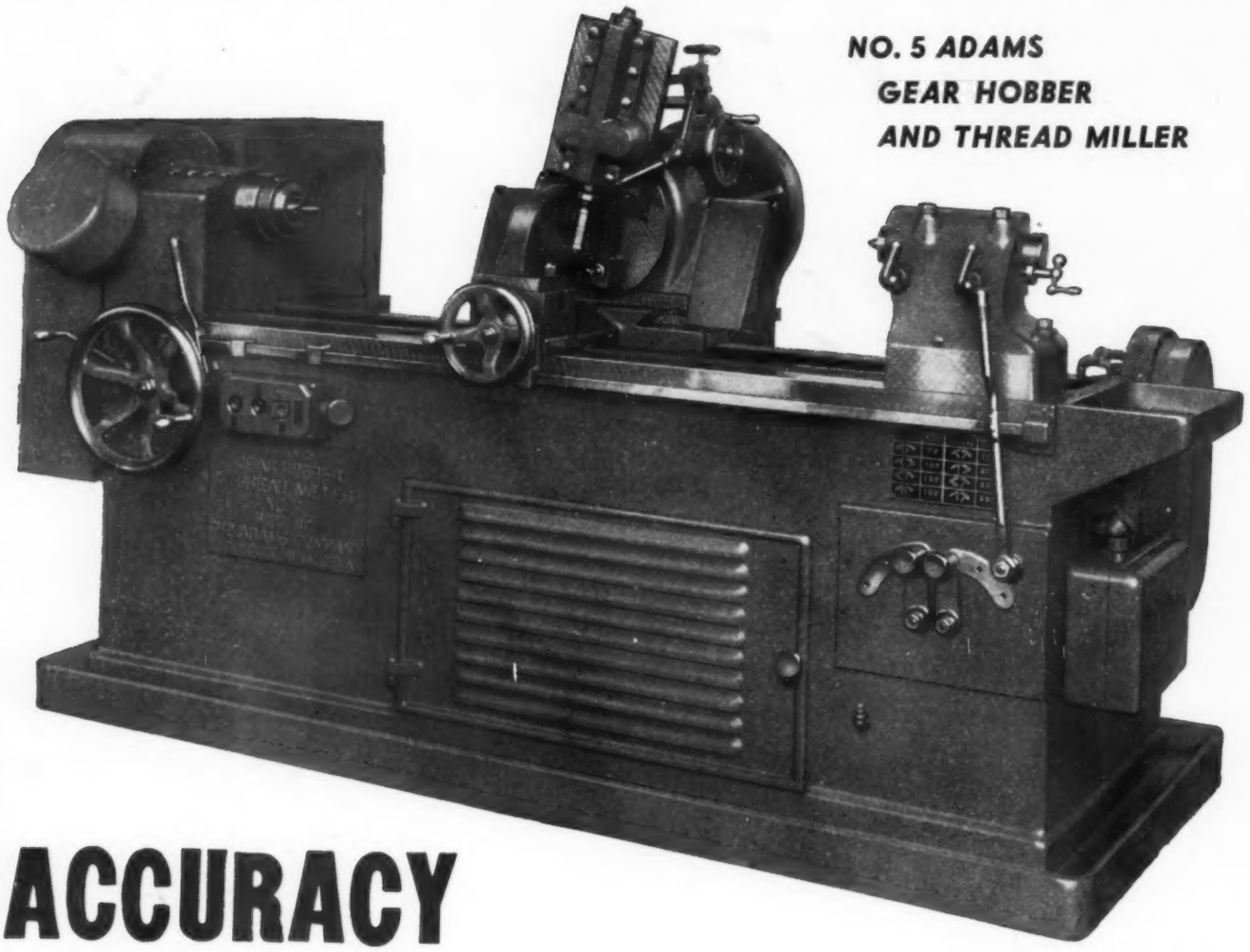
The 3/8" Threading Machines illustrated are used by a mid-western manufacturer for threading small aircraft studs. In this plant one machine produces more than a thousand 5/16" diameter by 5/8" long studs per hour. Threads are held to close tolerance specifications. Several thousand threads are produced per grind of the chasers.

The LANDIS Chaser

The finest Thread Cutting Tool in Industry

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·



NO. 5 ADAMS GEAR HOBBER AND THREAD MILLER

ACCURACY

AND PRODUCTIVE ABILITY . . . .

★ This precision machine has exceptional flexibility. Here too is simplicity of design and ease of control. Let us tell you about the many features which are conducive to smooth and rapid operation, great durability and enduring accuracy and alignnment.

Automobile manufacturers, Machinery builders and Gear manufacturers will find The Adams Gear Hobber and Thread miller a cost saving machine.

. . . FOR SPLINING TRANSMISSION SHAFTS

. . . FOR HOBBING TRANSMISSION GEARS

. . . STEERING WORMS, ETC.

DESCRIPTIVE LITERATURE ON REQUEST

ADAMS

THE ADAMS COMPANY
DUBUQUE, IOWA

ESTABLISHED 1883

For Speedy Precision Production

Canedy-Otto

8 SPEED MOTOR SPINDLE RADIAL DRILL

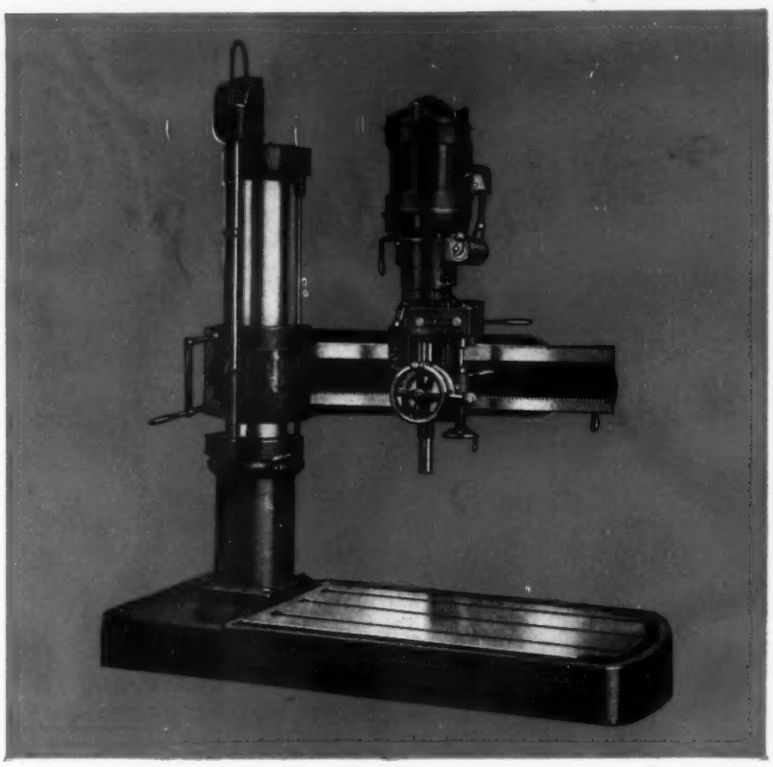
MANY EXCLUSIVE FEATURES

This new CANEDY-OTTO Radial Drill provides all the best features of many larger, more expensive radial drills, plus many exclusive features of its own.

It is powered by a 2-HP constant horse power, ball bearing mounted motor of 4-speed type, providing 8 spindle speeds; Three-button station provides instantaneous forward or reverse direction changes without going through the "stop" button for tapping; it has four rates of power feeds, changeable while machine is in operation; Large graduated dial and automatic trip provide for speed and accuracy in predetermined depth drilling.

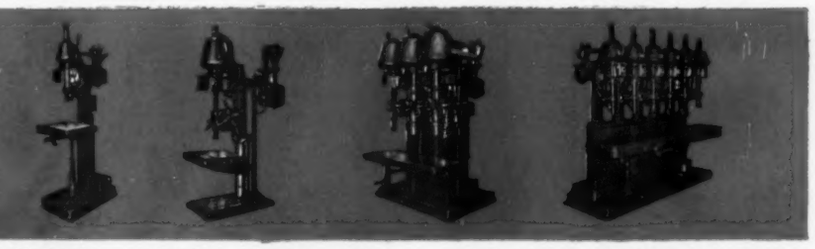
Column and arm rotate on annular ball bearings and Timken bearings. Vertical movement of the arm on the column is controlled by a 2-way drum switch and motor. Saddle head rides on ball bearings, but clamps on hardened jib, to relieve bearings of load. The base is heavily ribbed, provided with T-slots and coolant tank. Unit is available in 3 ft., 4 ft., and 5 ft. arm models.

Write for detailed specifications.



CANEDY-OTTO engineers *specialize* in the design and production of drill presses. We build nothing else. But we do offer the world's most complete drill press line — a faster, more productive, more economical drill press for every drilling need. See us first for your drill press requirements. And when you have a special drilling problem, let a CANEDY-OTTO engineer — a drill press specialist — help you solve it.

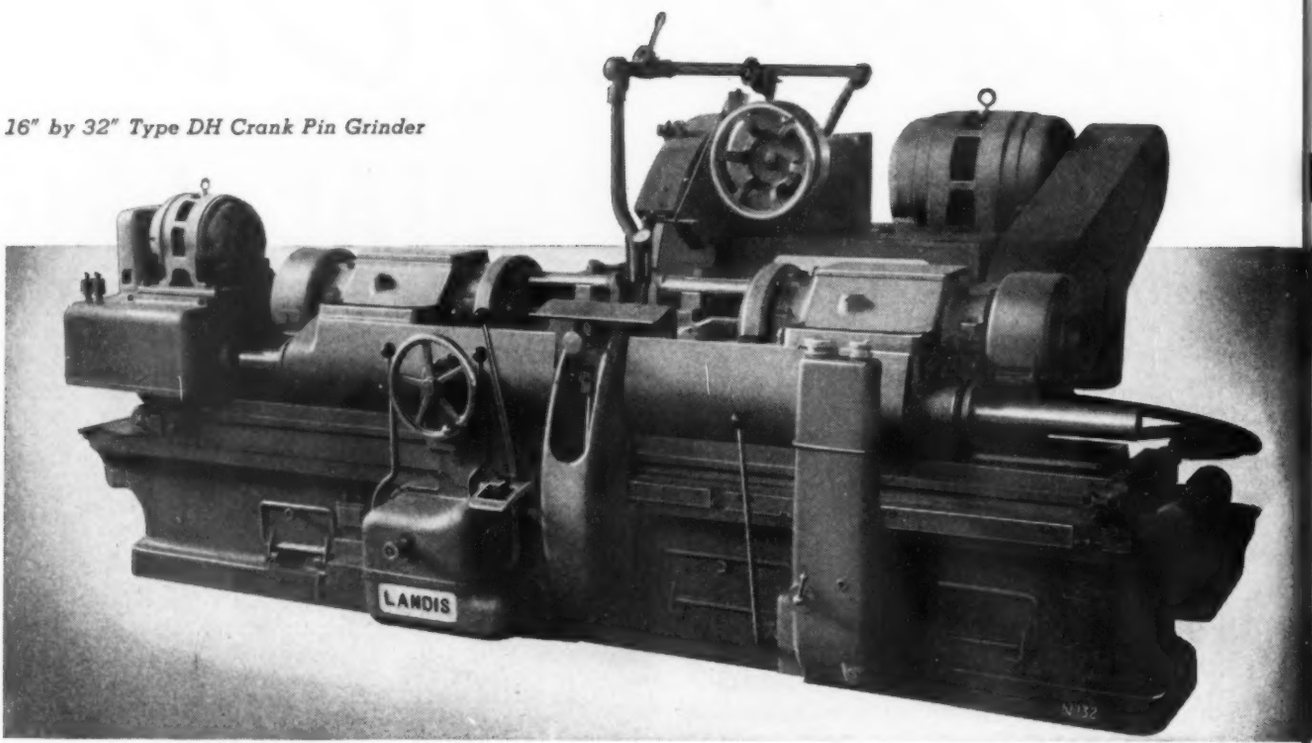
BUILDERS OF A COMPLETE DRILL PRESS LINE

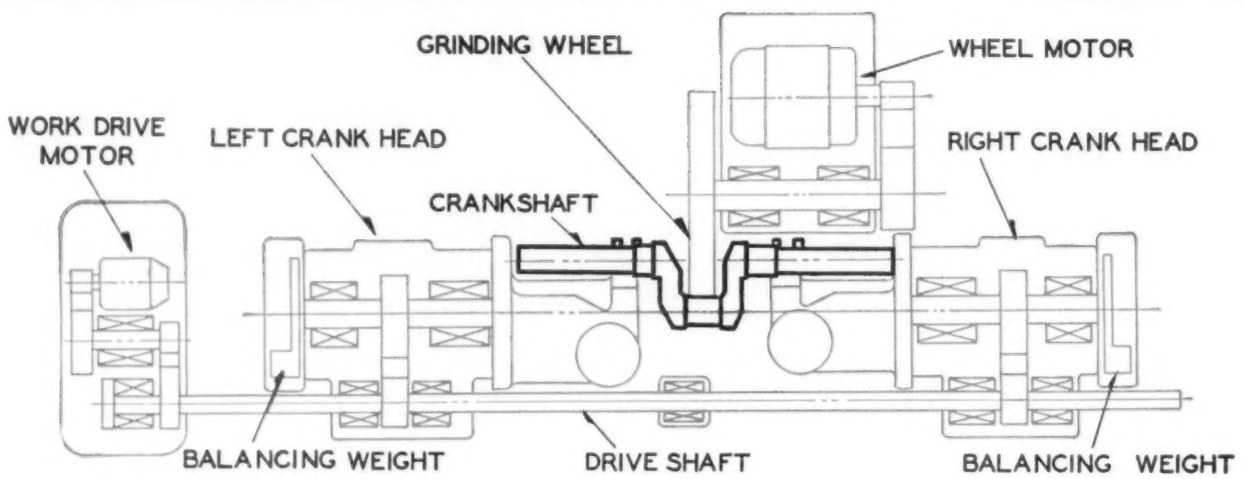


CANEDY - OTTO MFG. CO. — CHICAGO HEIGHTS, ILL.

How 6 Different C

16" by 32" Type DH Crank Pin Grinder





Simplified plan view showing chief features

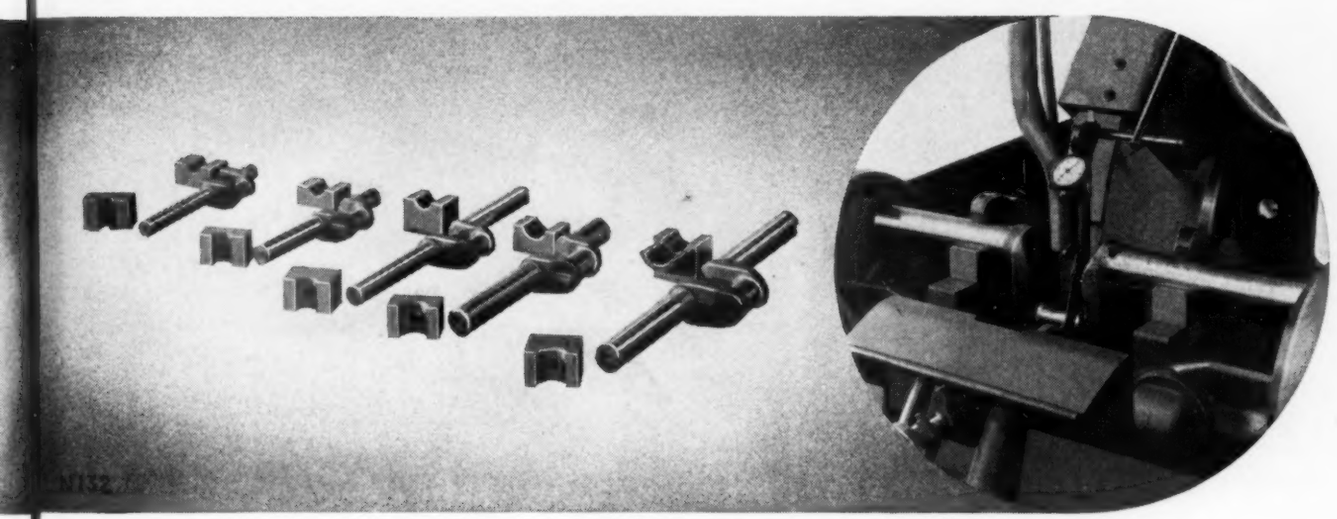
LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

tCrankshafts were Ground

on the Same Machine

THE PROBLEM — Grind Pins on These Six Shafts



THE SOLUTION

By LANDIS TOOL Engineered Grinding Service

Interchangeable Throw Blocks. Hydraulically operated clamps lock crank in grinding position. Other pin sizes ground on same machine using interchangeable throw blocks for various throws.

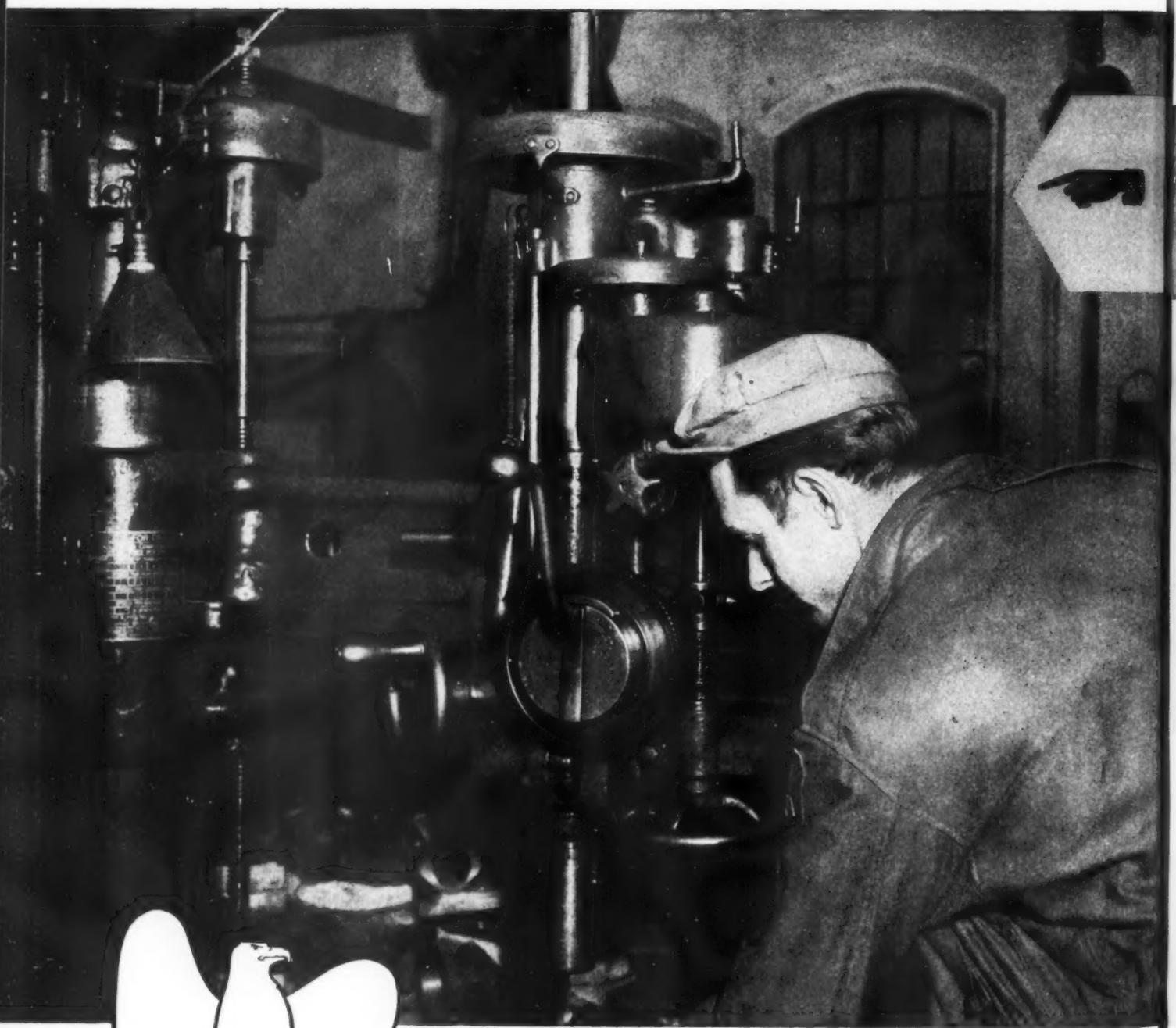
Grinding crank pins for six different throws was the problem of an engine builder. Since production runs did not justify separate machines, Landis Tool grinding engineers suggested interchangeable clamping blocks to hold the various throws in the crank carrying fixture. Readily accessible and quickly adjustable balancing weights make possible rapid shift from one size crankshaft to another with little loss of production time.

Your grinding problem may involve cylindrical, centerless, internal, shoulder, face, taper, or centerless thread grinding. In any event, Landis Tool Engineered Grinding Service will help you to a cost cutting solution at minimum investment. Write us details of your grinding problem. 57

WAYNESBORO, PA.

LANDIS TOOL *Company*

"AS OLD AS



THE AMERICAN TOOL WORKS CO.

METHUSELAH"

BUT STILL ON THE JOB...

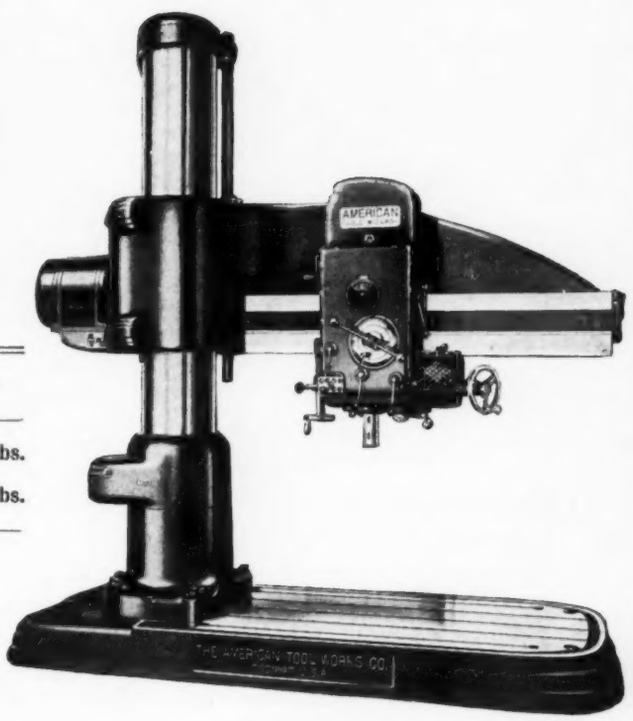
This War Department Photograph shows this 30-year-old "American" Radial still on active duty.

Doubtless it is expedient, during an emergency, to press usable machines into service in spite of their age, but such practice should be abandoned the instant that the emergency has passed. It is just too costly a practice for peacetime economy.

Unfortunately there are entirely too many machines of this vintage still in operation in metal working plants right here in our own country. They will have to be replaced with modern equipment just as quickly as possible if the low cost demands of the future are to be met.

Now compare the new 1946 model with its 30-year-old prototype and you will immediately see why these older models cannot be profitably used today.

	No. of Spindle Speeds	Top Spindle Speed	No. of Feeds	H. P. Motor Used for Driving	Weight
1946 Model.....	32	2000 r.p.m.	16	15	13,000 lbs.
1914 Model.....	12	500 r.p.m.	4	5	7,000 lbs.



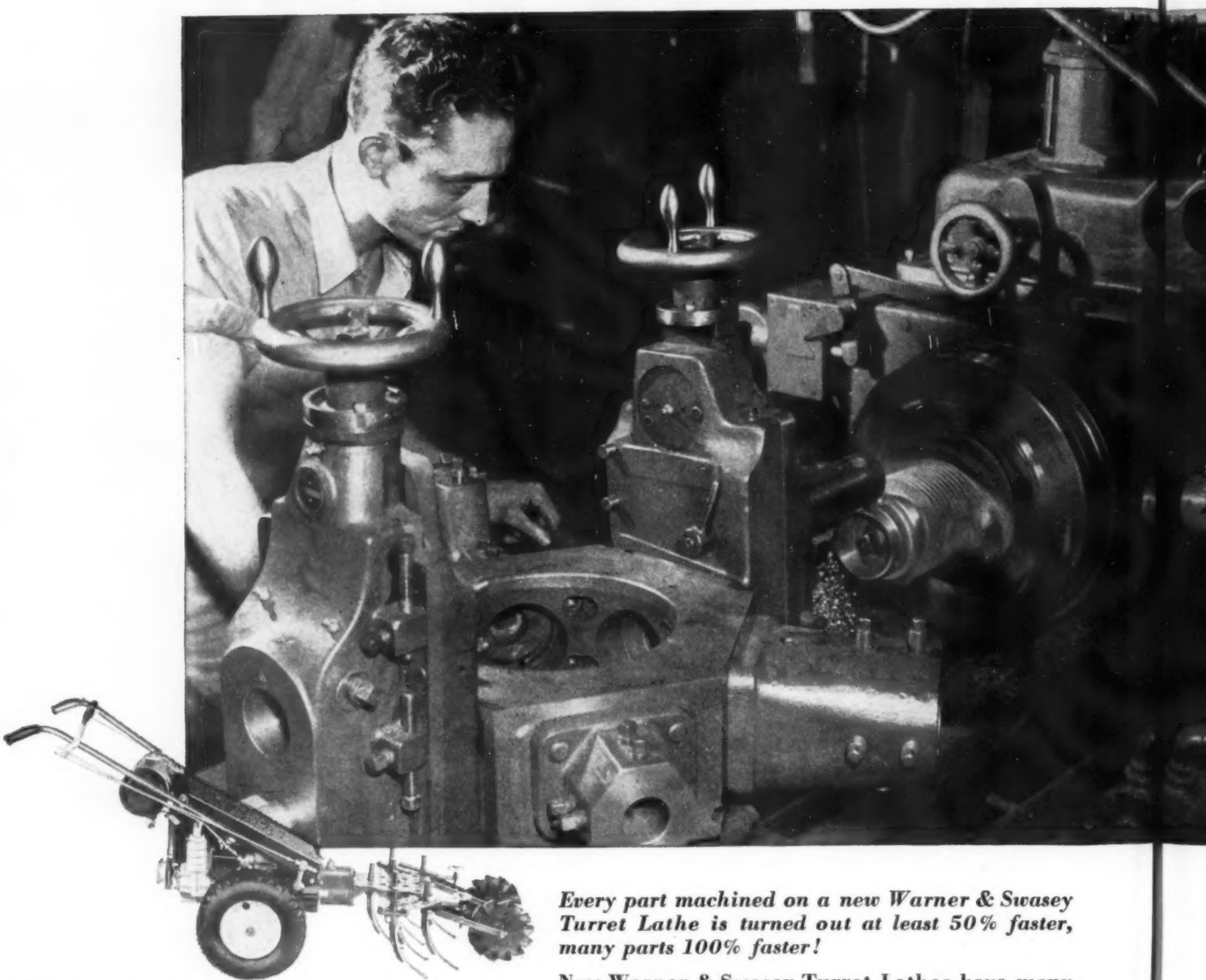
Modernize with "American"—the "newest new radial".

"American" Radials are low cost producers. They are modern; they are powerful; they have the stamina to insure unfaltering operation.

Send for descriptive literature

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Demand must be met by



THE Gravely Motor Plow & Cultivator Co., Dunbar, W.Va., had a backlog of thousands of orders for power-driven hand tractors and attachments at the war's end. Quick action was needed to speed more products to waiting dealers and consumers. To meet the accumulated demand, Gravely increased factory space and added a battery of new Warner&Swasey Turret Lathes to the production line.

Production up 50% to 100%

Now those Warner & Swaseys are helping to make rush deliveries out of back-orders by sharply reducing production time.

Every part machined on a new Warner & Swasey Turret Lathe is turned out at least 50% faster, many parts 100% faster!

New Warner & Swasey Turret Lathes have many time-saving design improvements to increase production and lower costs. They have greater power for taking heavier cuts at higher speeds. Their rigidity holds extreme precision on large chucking operations, as well as on small parts, to minimize scrap loss. Ease of handling decreases operator fatigue, permitting continuous high levels of output.

Call in a Warner & Swasey field engineer to look for ways to cut production time and costs in your plant, either through new Warner & Swasey Turret Lathes, or through new accessories which can be quickly installed to increase the productivity of your present turret lathes.

You can machine it better, faster, for less . . . with a Warner & Swasey

Production-not promises

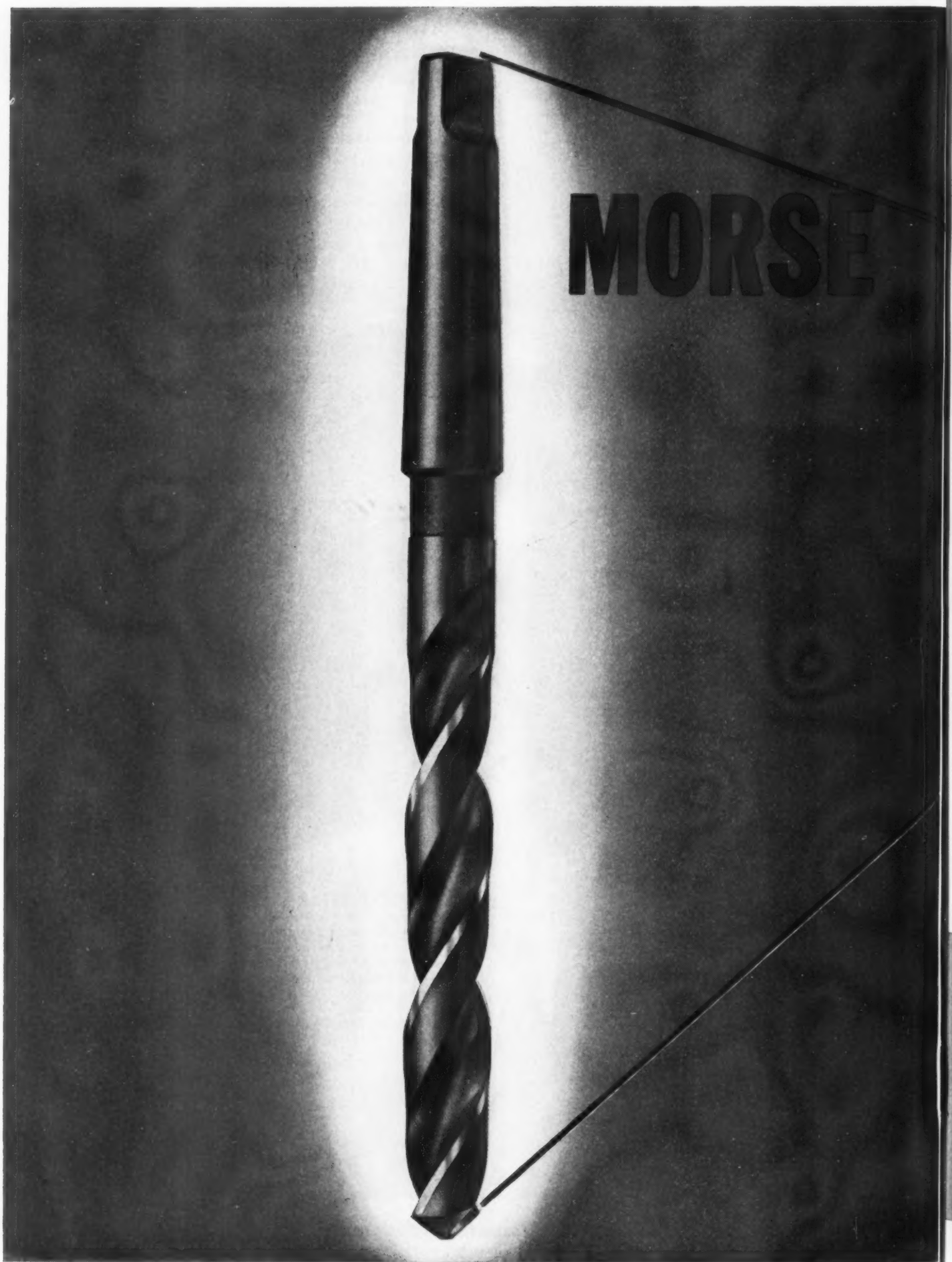
Gone are the days when manufacturers could feel secure because of a big backlog of orders. For the day has come when deliveries must be made promptly to avoid risk of cancellations, loss of sales and worse–loss of good customers.

PRODUCTION JUMPED 75% *when new No. 2-A Warner & Swasey Turret Lathes took over the job of turning out cylinder blocks for Gravely Tractors. Cast from high strength Meehanite, boring and facing the blocks calls for the extreme rigidity and power of a Warner & Swasey.*

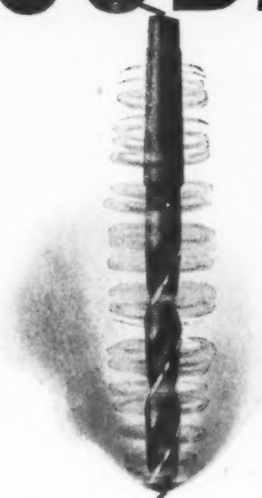
100% PRODUCTION INCREASE! *The picture at the left shows some of the many Gravely Tractor parts produced faster and more accurately by new Warner & Swasey Turret Lathes. One of them, a large chassis casting, is being turned out 100% faster than before on a new "A" type Warner & Swasey using standard tooling setups.*

WARNER & SWASEY
Machine Tools
Cleveland

Turret Lathes, Multiple Spindle Automatics, Precision Tapping & Threading Machines


MORSE

COBALT DRILLS PERFORM



Where Standard High-Speed Steel Drills Fail!

ON THE *TOUGHEST* GOING . . . manganese, hard steels, castings, forgings, and other difficult to drill material . . . Morse *Cobalt* Drills out-perform standard high-speed drills.

What's more, Morse *Cobalt* Drills can be run about 25% *faster.* They hold their cutting edges far longer, too . . . and they have the rigidity and strength to buck severe strains, when used in a rigid drill press with positive drive that will stand extreme point-pressure.

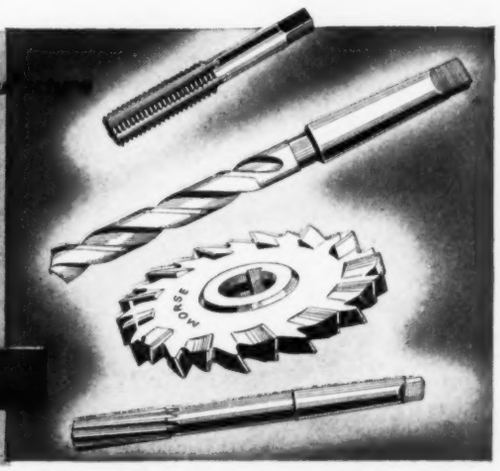
NOW . . . whether you drill tough steel, brass, plastics, or aluminum, always bear in mind that there is one Morse Drill of the right specification, length, diameter and twist-cut to do *your* job *best, at lowest cost.* And bear in mind, too, that with all these factors, it always saves you money to leave the complete specification up to us . . . through your distributor of Morse Twist Drills, Reamers, Taps, Dies, Milling Cutters, End Mills.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

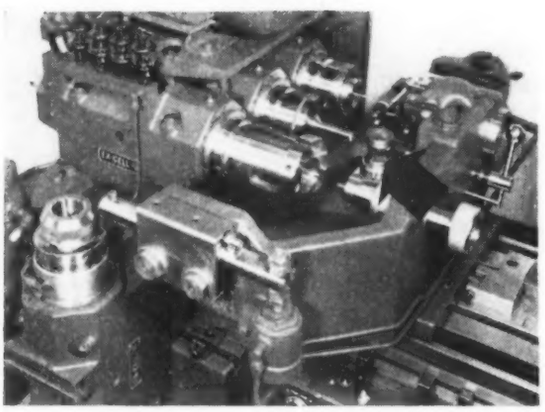
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS



NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

...Scrap Your Obsolete Equipment!



Close-up of fixture and tooling set-up to turn O. D., face end, bore pin holes and finish sides of ring grooves of refrigerator compressor piston (note part indicated by ▲). Four operations are executed on four pistons during one cycle of this Ex-Cell-O Precision Boring Machine.

XLO
EX-CELL-O for PRECISION

46-91

Obsolete machines are wasteful in today's competitive picture. Designed to help manufacturers meet the cost problem, Ex-Cell-O Precision Boring Machines frequently offer increased production, less handling of parts, smaller floor space requirements, and greater economy through multiple operations. These savings are the result of Ex-Cell-O's many years of experience in the manufacture of precision machine tools. In boring, as in many other metal-working operations, Ex-Cell-O engineering can show you the way to lower unit costs, through machines designed to meet your production problem.

EX-CELL-O

makes

- Standard and Special Multiple Way-Type Precision Boring Machines
- Multiple Drilling and other Special Purpose Machines
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Broach Sharpening Machines
- Continental Cutting Tools
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Drill Chip Breakers
- Inspection Fixtures
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines
- Aircraft and Miscellaneous Production Parts

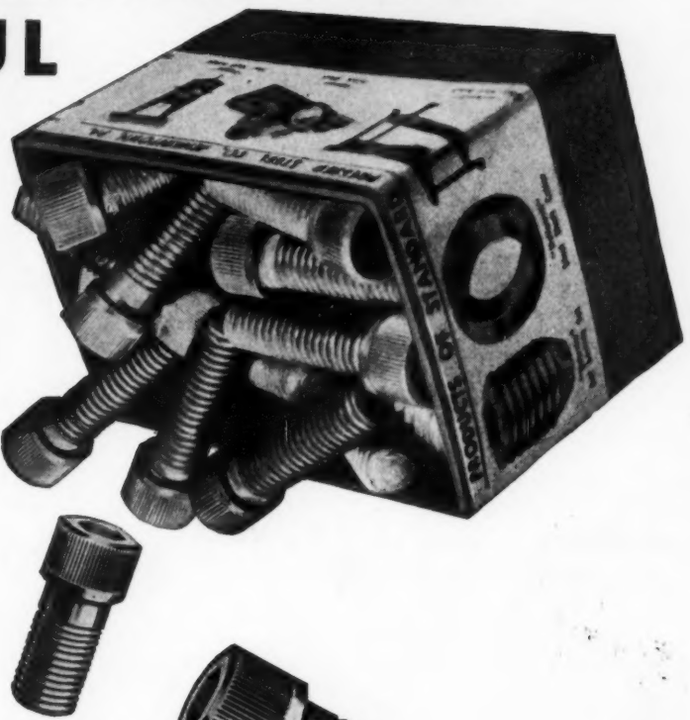
GET YOUR FREE COPY of this useful book. Illustrates and describes Ex-Cell-O's complete line of Precision Machine Tools, Cutting Tools, and facilities for parts production. Write today for your free copy of Ex-Cell-O Bulletin 27121.

EX-CELL-O CORPORATION • DETROIT 6

OF COURSE YOU CAN BUY UTILITY AND SAVED TIME BY THE BOXFUL

(.....when you order UNBRAKO* Knurled Socket Head Cap Screws)

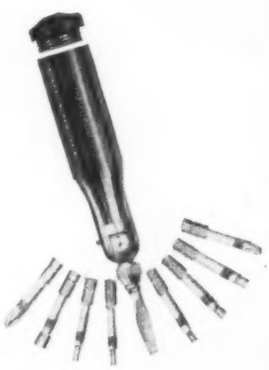
*Reg. U. S. Pat. Off.



Each box of "Unbrako" Knurled Socket Head Cap Screws is full of *saved time*, strength and utility! Saved time . . . because the knurled head of the "Unbrako" Socket Head Cap Screw provides a slip- and fumble-proof grip, even for oily fingers, so it can be screwed-in faster and farther before it becomes necessary to use a wrench. And this screw has the qualities of utility, strength, hardness and accuracy for which "Unbrako" products have become famous.

"UNBRAKO" SOCKET SET SCREW WITH THE KNURLED CUP POINT

is a Self-Locker, because the knurled point digs-in and positively won't budge in spite of the most chattering vibration! Yet, this screw can easily be backed-out with a wrench and used again and again. Both screws in sizes from #4 to 1½"; write for the free "Unbrako" Catalog.



"HALLOWELL" KEY KITS . . . are modern MUSTS, wherever Socket Screws are used. The hollow handle of Celanese* plastic contains the necessary interchangeable tool bits of superior alloy steel. Bits chucked as shown, when used. Their everyday and everywhere usefulness has made them immensely popular.

"Unbrako" and "Hallowell" products are sold entirely through distributors.

Knurling of Socket Screws originated with "Unbrako" in 1934.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

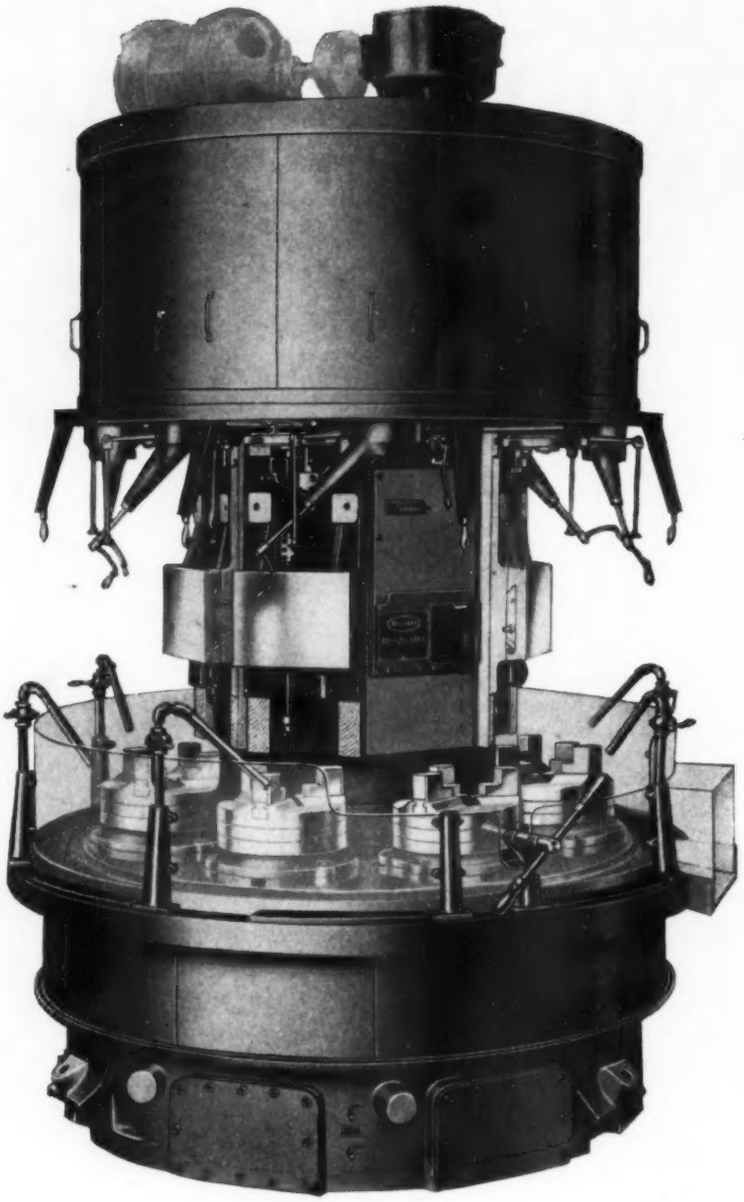
JENKINTOWN, PENNA. BOX 4

BRANCHES

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

A Special-Purpose Machine for Long Runs

A Versatile Machine for Diversified Schedules



A MULT-AU-MATIC IS BOTH

Bullard Type D MULT-AU-MATICS are made with 6 or 8 spindles in 4 sizes for work up to 23" diameter.

Many Bullard Mult-Au-Matic users tool them up and let them run on the same job for years. No other machine has such an outstanding production record on high-speed, heavy-feed, tough-metal, continuous operation.

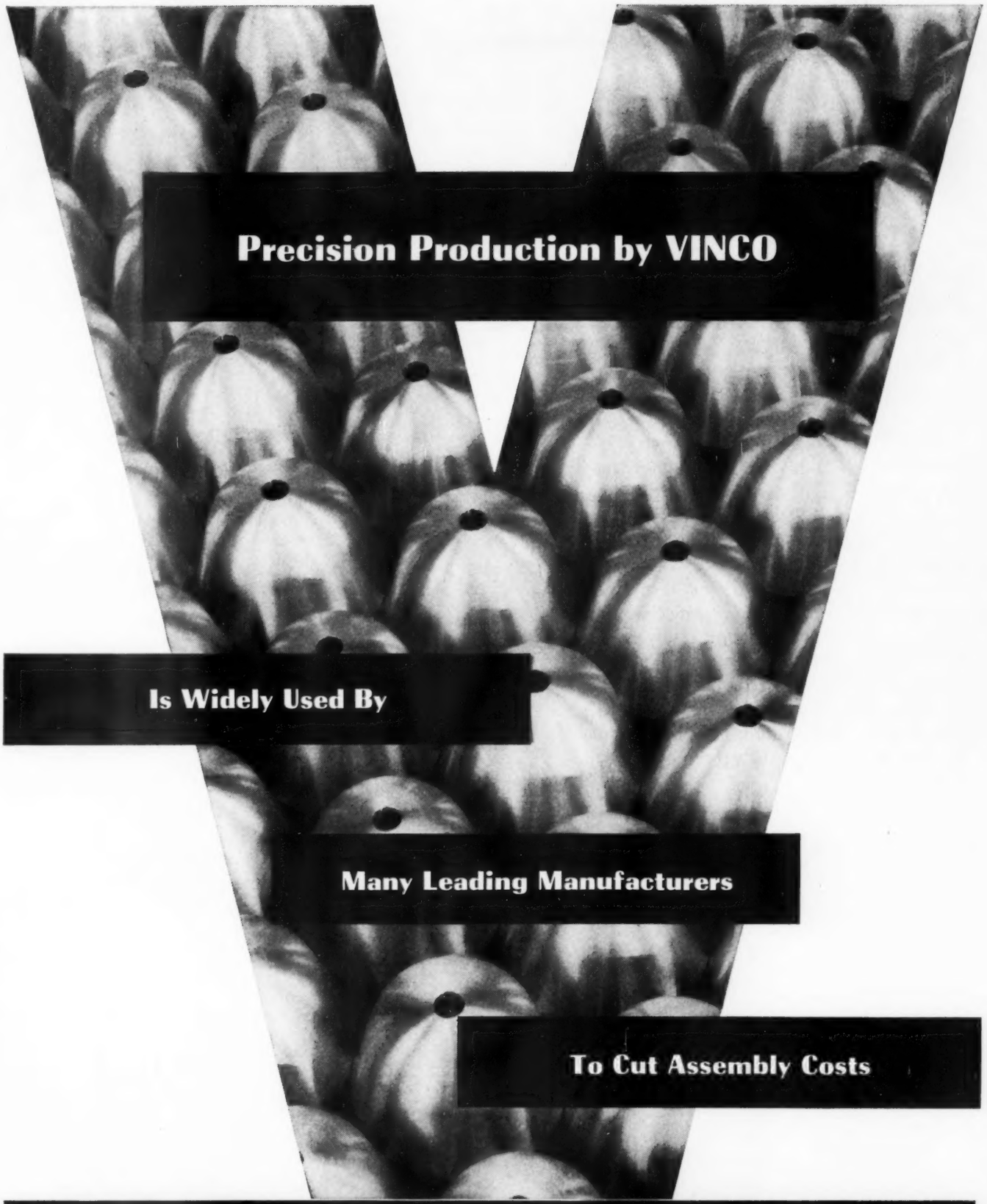
Other Bullard Mult-Au-Matic users find short runs profitable because change-over from one type of work is relatively simple. That's because the Universal, Convertible Double-Purpose and Auxiliary heads are quickly and easily set up for new operations. Moreover, each tool head has 82 independent feed rates . . . and each spindle has 41 independent speeds. ***Bullard Engineering Service can help you simplify your retooling requirements.***

Complete data describing the ability of Mult-Au-Matics to make long runs and diversified schedules profitable are contained in Bulletin MAM-D7-6-45.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE



MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

They Came To

The Part . . .

All tolerances on this star are within .0001".

The Fixture . . . Designed and built by VINCO to control the slotting operation on the above part. It is plainly apparent that extreme accuracy and painstaking construction of the fixture is mandatory if the specified tolerances of the part are to be held. This is a typical example of all precision fixtures built by VINCO. A thorough analysis of the job requirements, careful designing, skillful grinding, lapping and finishing of all essential parts to a gage exactness is VINCO'S established procedure in the construction of precision built fixtures.

VINCO

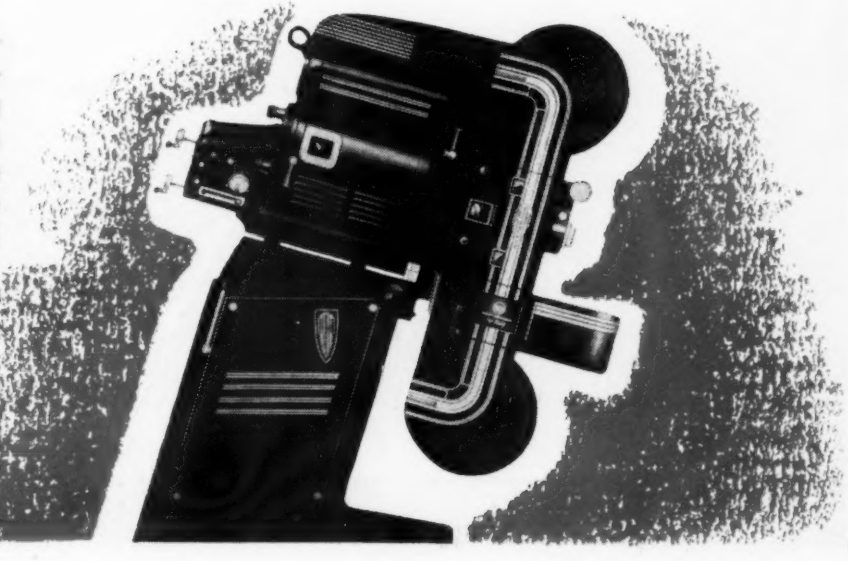
With a tough production job. Toil and sweat had convinced the Brenkert Light Projection Company, a subsidiary of Radio Corporation of America, that the star part, shown on the opposite page, would require an overall accuracy to within .0001" if it were to function at its planned efficiency. *Twenty-four times each second* this part must start and stop and, between each pause, attain a speed of 3485 R.P.M. Such performance called for accuracy to the Nth degree and Brenkert knew they needed the "tops" in gages and fixtures to attain and hold such close limits so;

They Came to Vinco

Our successful completion of this and many other assignments for Brenkert Light Projection Co., is a matter of record. The surest way to gain and maintain precision production of any part or parts is to first ascertain and then supply the needed equipment to make this production possible. Selecting and producing this equipment requires highly specialized engineering knowledge and mechanical skill. A proven, reliable source for this specialized service is VINCO. Over twenty-five years of widely varied experience in close tolerance work is our guarantee for this statement.

The Product . . .

The Brenkert "80" Motion Picture Projector—the successful result of ceaseless research, superlative engineering and skilled craftsmanship. Hidden away in this projector is the star we have been talking about. It is the vital element of a finely co-ordinated mechanism known as the intermittent. It is the action of this intermittent which produces the illusion of motion that you see on the screen. The vastly improved action of the Brenkert Intermittent has reduced annoying picture unsteadiness to its lowest point and increased light efficiency to the highest degree yet attained.



Would you say your grinding is perfect?

Unless a complete analysis of your grinding has been made... unless the correct wheels and machines are on your job . . . the best you can have is second best.

But you can have grinding second to none in production speed and low cost if you shift to Peninsular job-designed wheels.

For best results, call in Peninsular engineers. They study your machines, they study your grinding methods, they study the metals you grind. Their findings are used to develop grinding wheels and machines for maximum production speed.

Peninsular can show you the way to reduced grinding costs that will be worth your while. *Every* Peninsular grinding wheel is specially made for its particular job.

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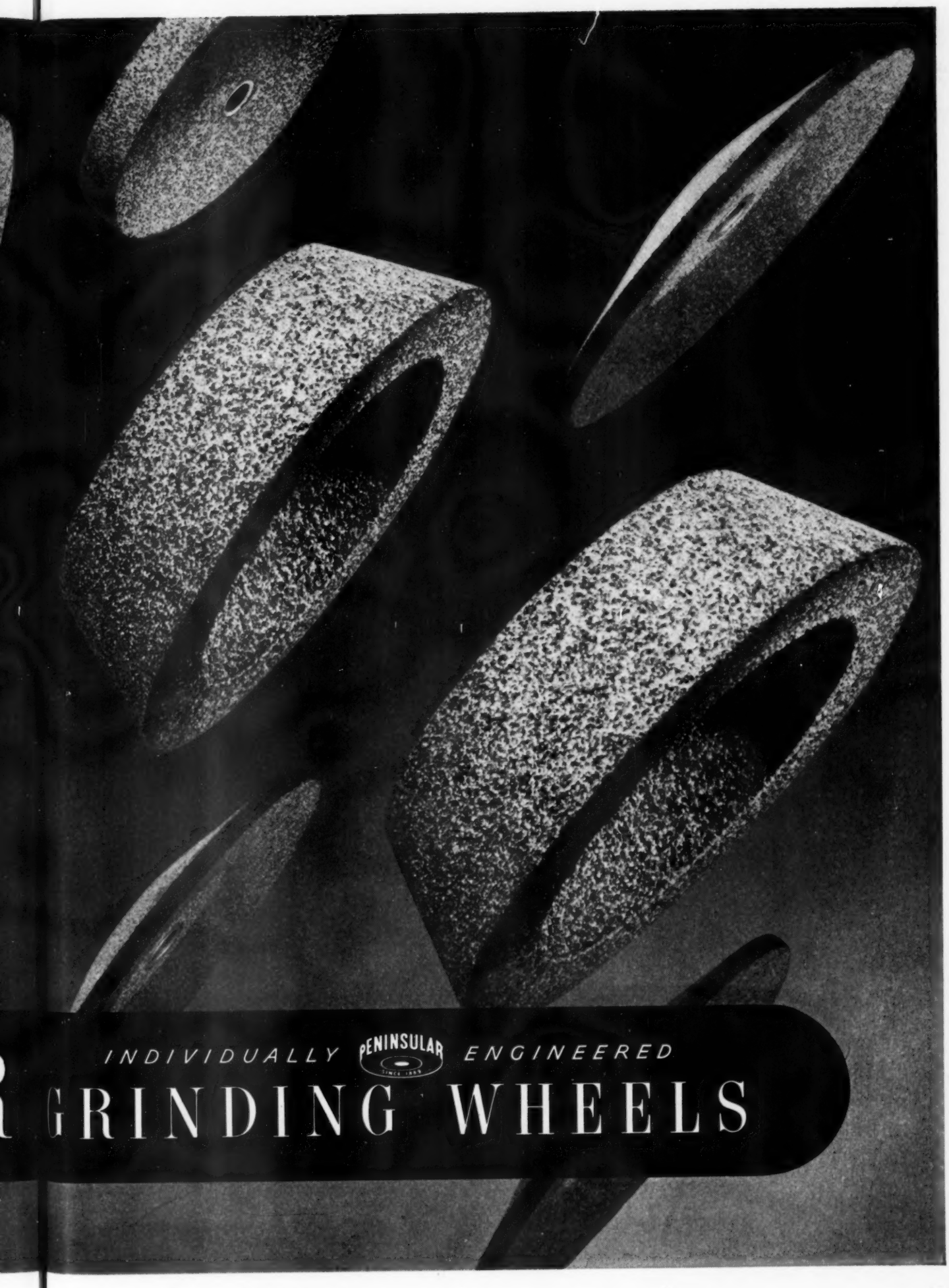
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NOW AVAILABLE AS HAND-OPERATED ELECTRIC-OPERATED AIR-OPERATED *Presses...*

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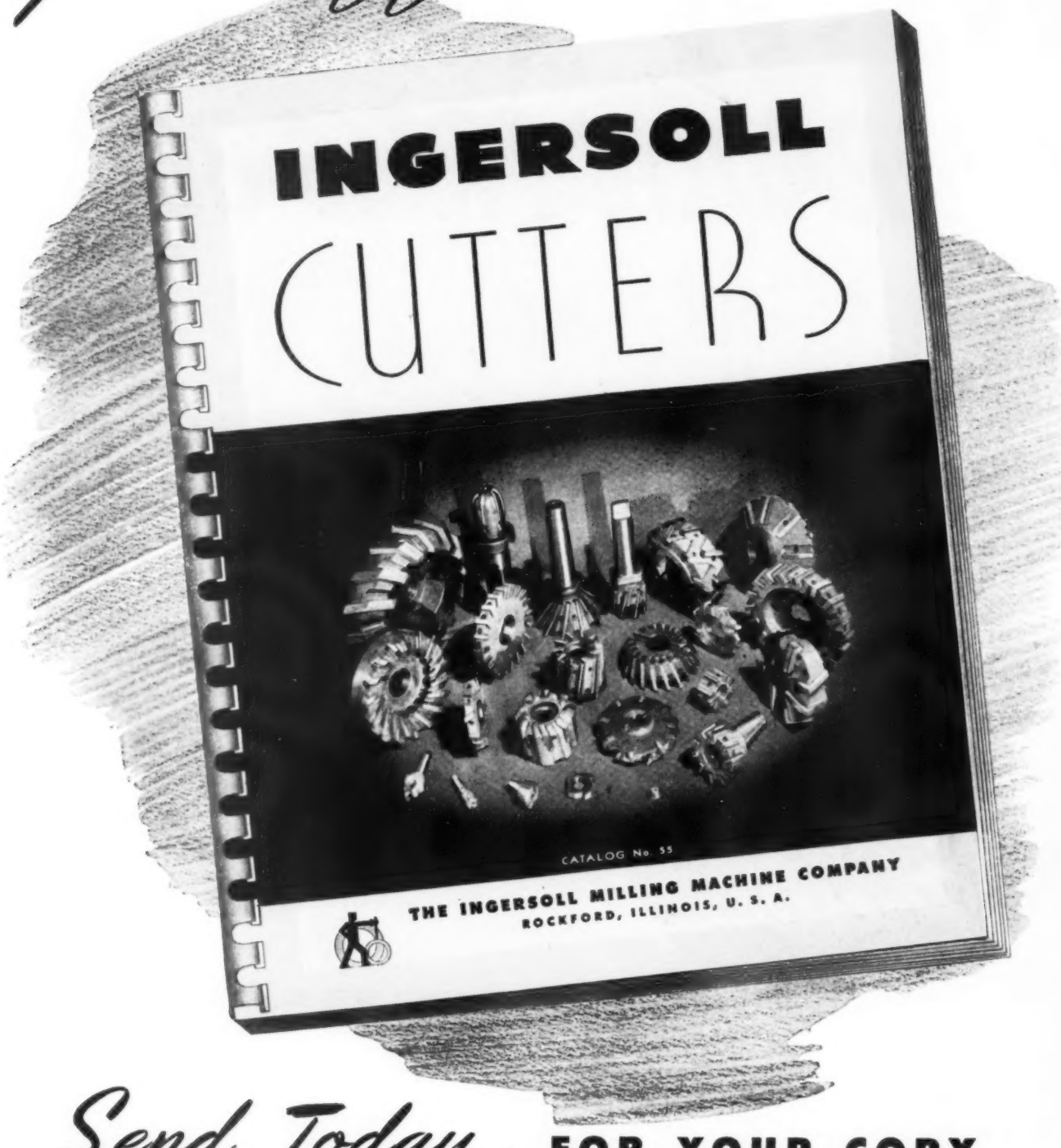
Just Off the Press!



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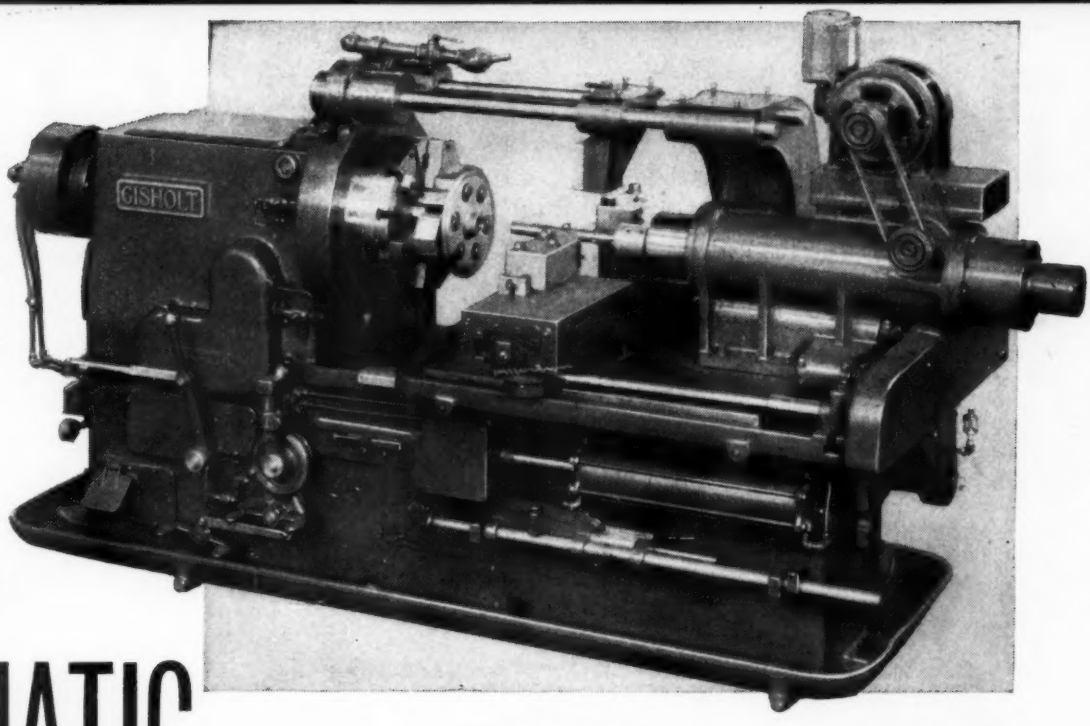
Builders of Inserted Blade Milling and Boring Tools



tandard platen type Simplimatic, ecially tooled for machining rear drive gear hubs, in combination standard tool slides, is equipped h motor-driven quill for rotating he boring bar. Part is completely ined with 7 rough and finish cuts in 2½ minutes, floor to floor.

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SIMPLIMATIC *makes it* SIMPLE — *and* FAST!

Here's another example of the adaptability f the Gisholt Simplimatic—a standard machine hich gives you all the advantages of an auto- atic lathe individualized for the specific job.

This is made possible by the large horizontal laten table which permits a greater number of dependent tool slides, each favorably cammed r its own particular cut, and providing an eal condition for each tool as to cutting speed and feed, order of engagement, dwell and retract.

Rugged, fast, and accurate, the Simplimatic pays dividends in any shop, small or large, seeking maximum production at minimum cost. Ask for complete information.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . .
with Gisholt

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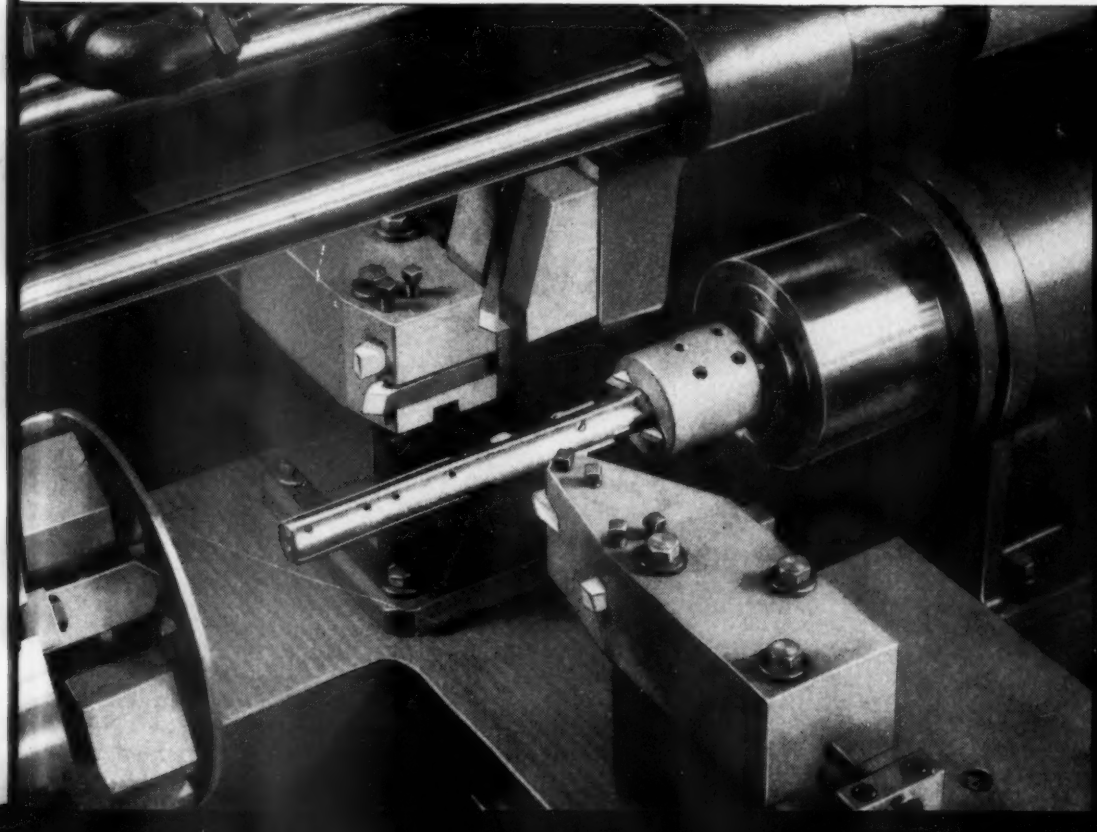

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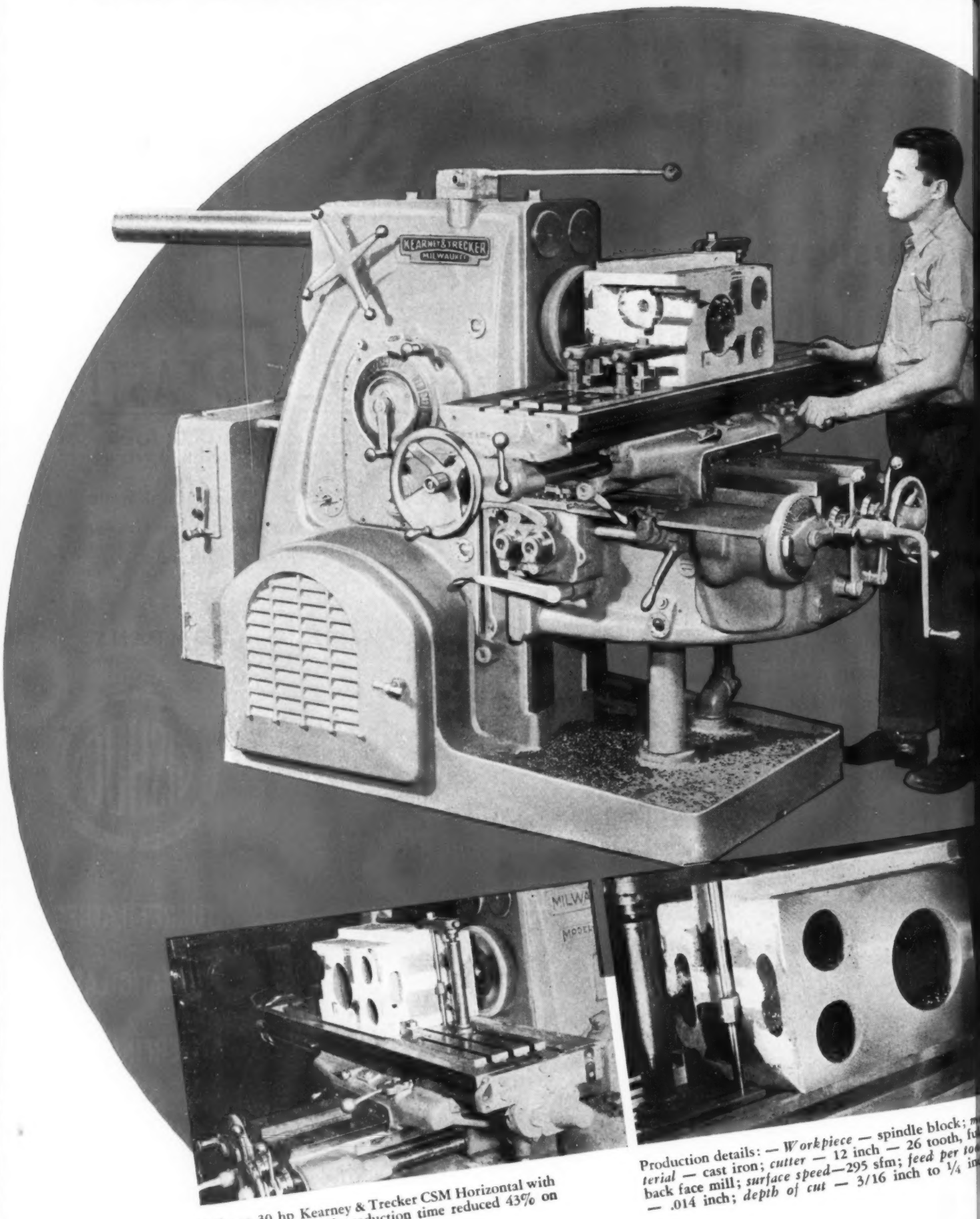


Using a 30 hp Kearney & Trecker CSM Horizontal with carbide cutters, total production time reduced 43% on this face milling operation.

Production details: — *Workpiece* — spindle block; *material* — cast iron; *cutter* — 12 inch — 26 tooth, full back face mill; *surface speed*—295 sfm; *feed per tooth* — .014 inch; *depth of cut* — 3/16 inch to ¼ inch

Machines of Their Type!

20-30-50 hp

Kearney & Trecker CSM's

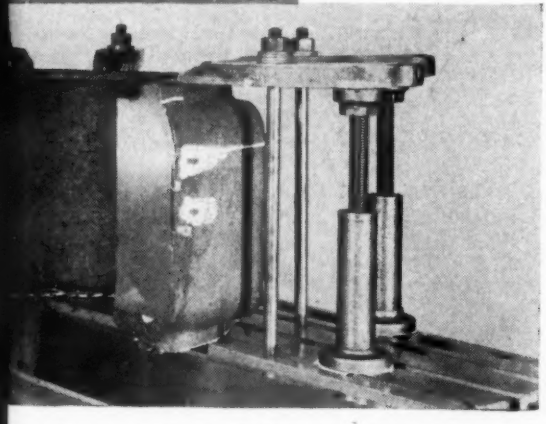
★ You get new high rates of metal removal—ferrous and non-ferrous — without sacrifice of precision.

★ —you get closer tolerances—finer finishes—precision performance — through smooth flow of power to the cutter.

★ —expressly designed for carbide milling of steel but adapted to all-purpose milling, as well.

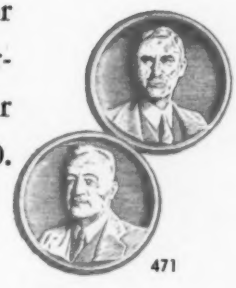
★ —broad range of application — wide range of speeds and feeds.

★ —exceptional ease of operation — centralized conveniently located controls.



Machine Time Reduced 87%:—surface finishes improved when this operation was performed on a 20 hp CSM Horizontal using carbide milling cutters! *Workpiece* — bearing shell; *material* — cast steel; *cutter* — 10 inch, 12 tooth CSM face mill; *surface speed* — 460 sfm; *feed per tooth* — .010 inch; *depth of cut* — 3/16 inch to ¼ inch.

Engineered—from the ground up—for every milling need of today and tomorrow — investigate Kearney & Trecker CSM's; write for Catalog No. CSM-20.



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Kearney & Trecker
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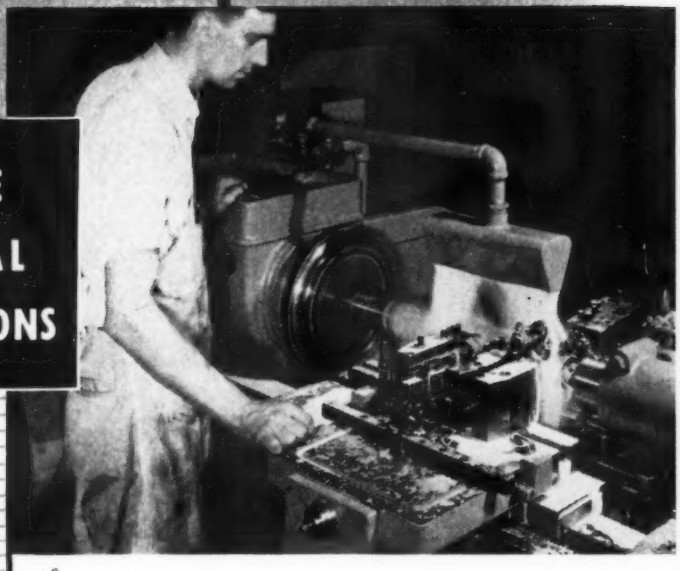
"Be Ready for Tomorrow — with CSM's!"

how to improve MACHINING METHODS for ELECTRIC MOTOR PARTS with SUNDSTRAND "ENGINEERED" PRODUCTION

THREE TYPICAL OPERATIONS



1— TURNING SHAFTS . . .

Rough and finish multple tool turning both ends of motor shafts in four operations. Shafts come cut to length and centered. Sundstrand automatic lathes completely turn twelve different sizes of motor shafts. Carbide tools, multiple tooling and automatic cycling increase production over the single tool lathes previously used for this work. Operator's only duties are to load and unload parts and start the automatic machine cycle.

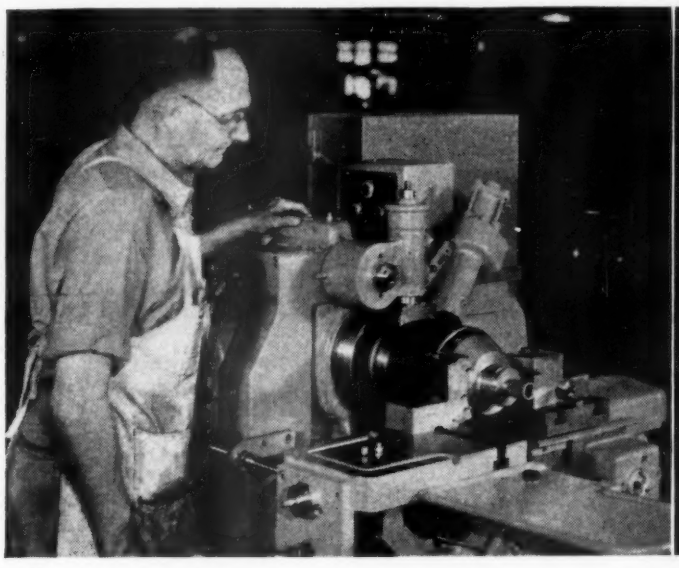
Illustration is of tooling setup for rough turning operation on one end.

Motor frames, commutator assemblies, armature assemblies, rotors, shafts, etc., all turned on Sundstrand automatic lathes. Parts are turned in both long and short runs.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

HERE'S an interesting example of Sundstrand "Engineered" Production as applied to the manufacturing of electric motors. These motor components vary in size and operations required. Each is machined on Sundstrand equipment with a method best suited to the production requirements of the plant in which the machines are installed. If you manufacture electric motors of any type, our engineers have had practical experience which may prove helpful in improving your machining methods. Call on them without obligation.



2—TURNING RABBET FITS . . .

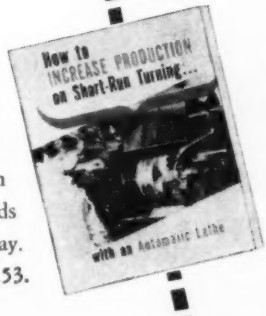
This standard Sundstrand automatic lathe bores the inside diameter of both ends, chamfers the inside diameter and outside diameter of both ends and faces the ends of a stator frame and coil assembly. Eight tools are used to complete the operation in one machine cycle. Machine and tool adjustments enable this equipment to be used on a number of different sizes of parts.

3—TURNING, FACING AND SHAVING ARMATURE ASSEMBLIES

This Sundstrand is equipped with four tool slides . . . two front, one rear and one overhead. Operator's duties consist only of loading, unloading part and starting machine cycle. The tool slides automatically rapid approach, feed, rapid return and stop. The four T. C. tipped tools turn the laminations, face off the end of the windings and shave. Several different sizes of parts are handled on this machine.

FREE

This booklet contains useful turning information on a wide variety of parts and materials. A study of these modern tooling methods may reveal profitable methods for you. Write for your copy today. Ask for bulletin No. 153.



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Forgings to close tolerances, necessitating a minimum of machining and yet complicated in form, are being produced today on ACME XN Forging Machines. Add to this accuracy the high production rate, trouble free operation and low maintenance costs which have made ACME XN machines famous and you have a real dividend paying combination. ACME XN Forging Machines are built in sizes from 1" to 5" capacity.

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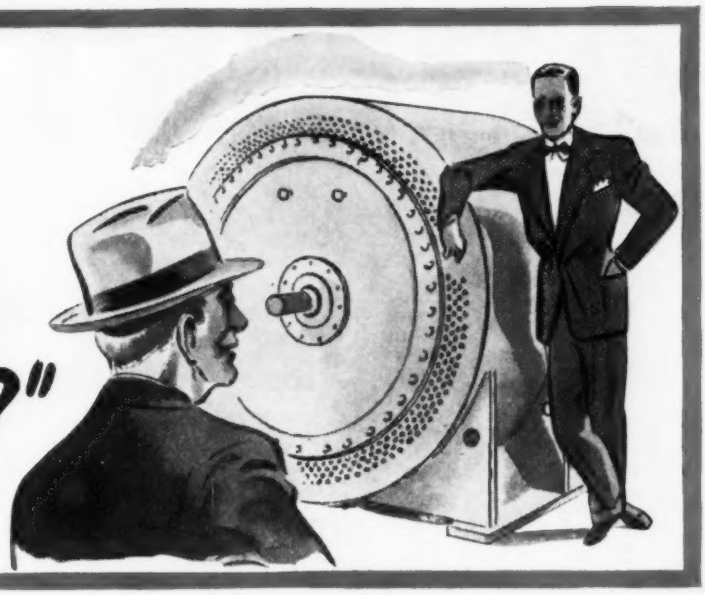
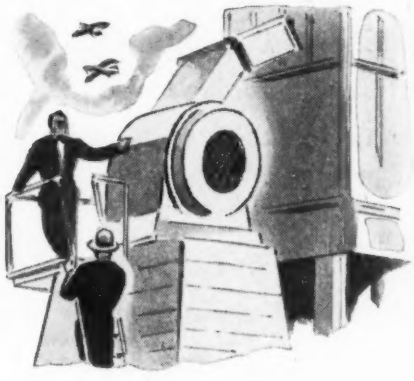
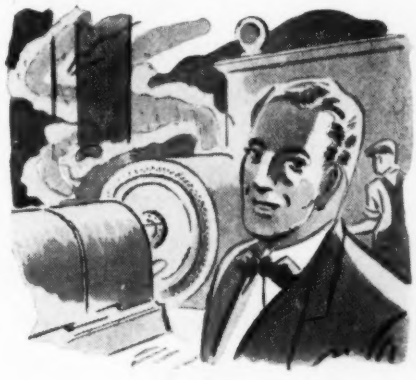






"Right. In Allis-Chalmers' modern motor line we're now prepared to offer you a *complete range* of outdoor weatherproof, totally-enclosed motors all the way from small, standard ratings to sizes of 2,000 hp or larger."

"Why, That Means Then," our customer exclaimed, "in larger ratings they fill the need of power plant engineers who want to install equipment like draft fans *outside*, and thus keep down structure costs per kw capacity." Right again —and they fit into *other* industries too!

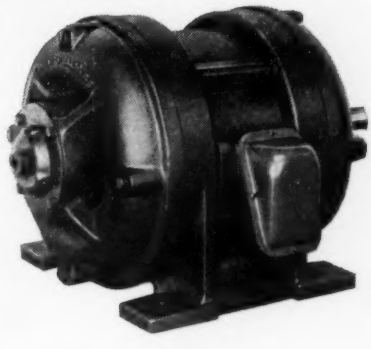
Chemical, for instance. Here cast iron motors have generally been preferred . . . because they stand up better under acid and alkali conditions. But now these *new* motors, with *new* design improvements, promise to provide several important operating advantages . . .

We've Re-designed the heat-transfer system to *improve ventilation.* We've *reduced maintenance* by making air passages not only more accessible, but practically *self*-cleaning as well. And we've *eliminated* liquid and dirt-trapping pockets. In the smaller ratings we of course offer our standard design.

Looking for a Good Motor?

SPECIFY "Allis-Chalmers"! For whether your job calls for a large motor like that above, or a small standard machine, you can be sure of getting two things when you specify "Allis-Chalmers:" 1) Exactly the right type and size motor; 2) consistent with the finest quality workmanship of which we are capable.

For the full story of liberal Allis-Chalmers motor construction, call our nearby dealer or sales office. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2117



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They'll carry the load

Specify ARMSTRONG Drop Forged EYE BOLTS for extra strength—correctly engineered proportions, forged-in quality, uniformity of design in all sizes, and the best mild steel, heat treated to increase tensile strength.

ARMSTRONG Drop Forged EYE BOLTS as built to tool standards, are not hammered out in "tonnage forgings". They come in plain or shoulder patterns, blank or threaded, in 14 sizes, shank diameter from ¼" to 1½", inside diameter of eye ¾" to 2½". They will always carry their rated load safely.

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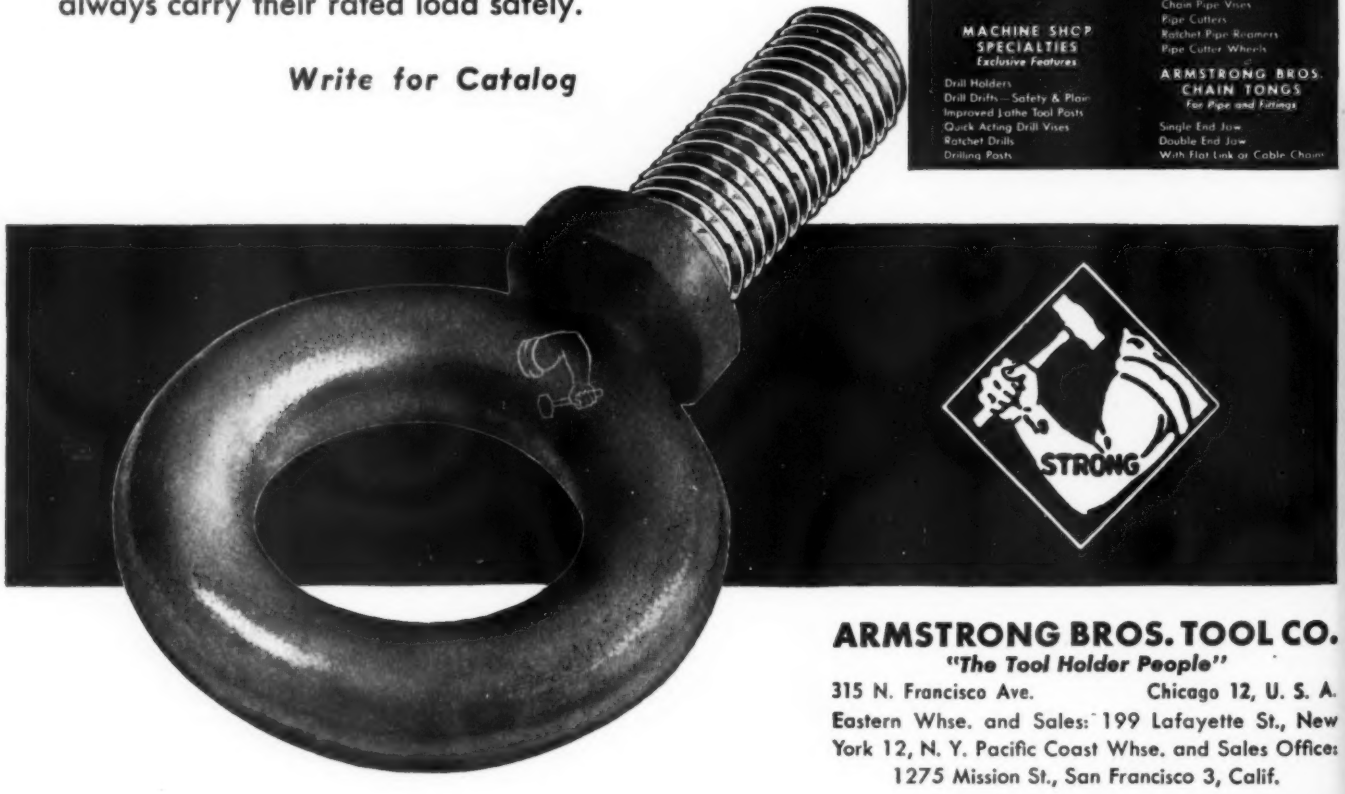

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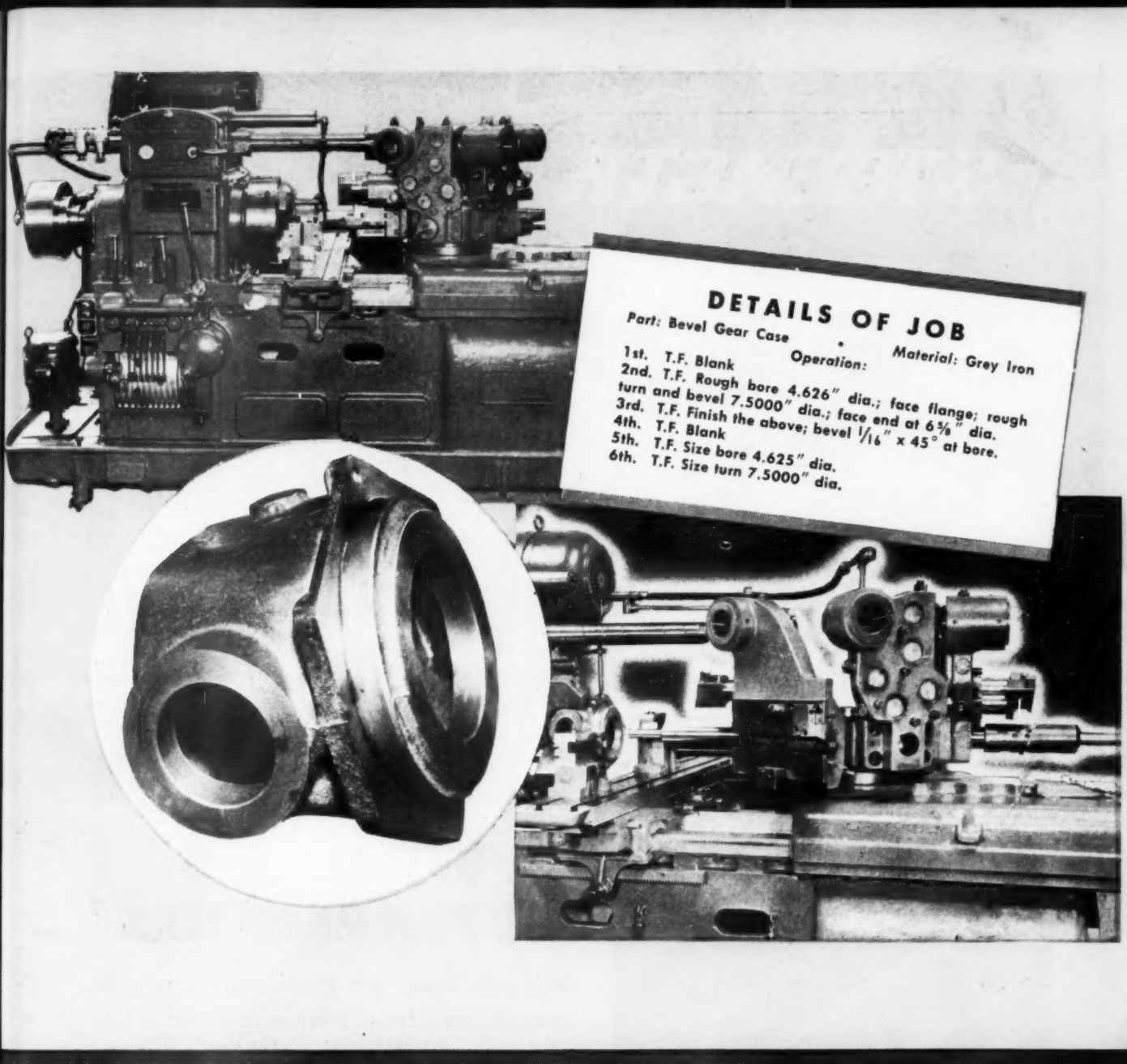


DETAILS OF JOB

Part: Bevel Gear Case • *Material:* Grey Iron

Operation:

1st. T.F. Blank
2nd. T.F. Rough bore 4.626" dia.; face flange; rough turn and bevel 7.5000" dia.; face end at 6⅝" dia.
3rd. T.F. Finish the above; bevel 1/16" x 45° at bore.
4th. T.F. Blank
5th. T.F. Size bore 4.625" dia.
6th. T.F. Size turn 7.5000" dia.

P&J TOOLING...*planned for the job... makes fast floor-to-floor time possible on a* 5DLX AUTOMATIC

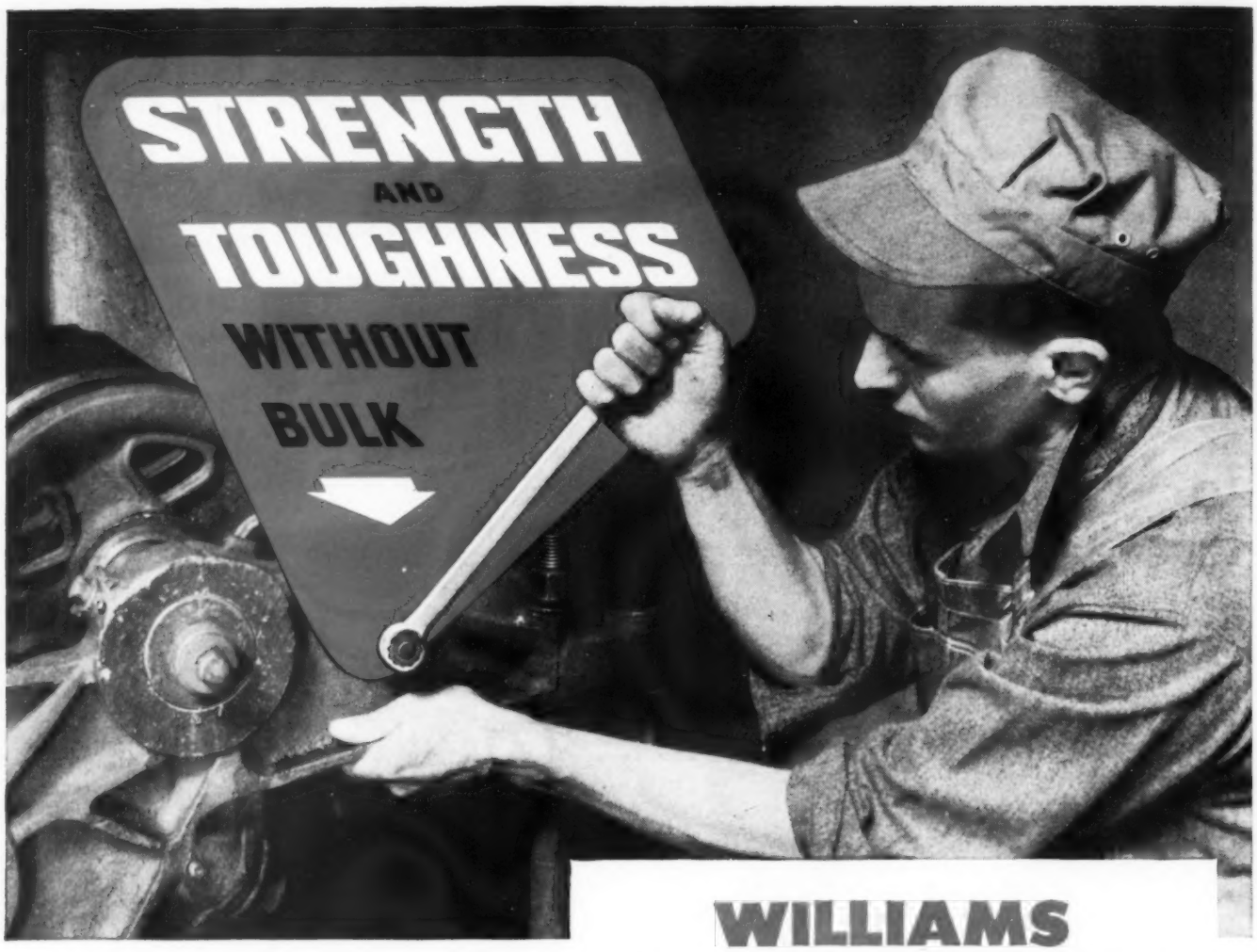
Tooled for the job, this P&J 5DLX Automatic saves time and money in producing the part shown. Details as to floor-to-floor time and hourly production are available on request.

One of the reasons for the outstanding performance of P&J Automatics is the fact that these machines are designed and powered to take full advantage of the cutting possibilities of tungsten carbide tools. Fast cutting speeds and maintained accuracy can be depended on at all times. Outstanding performance also is assured with a minimum of effort on the part of the operator because of the convenience provided in control. A battery of these machines can actually be handled by one operator.

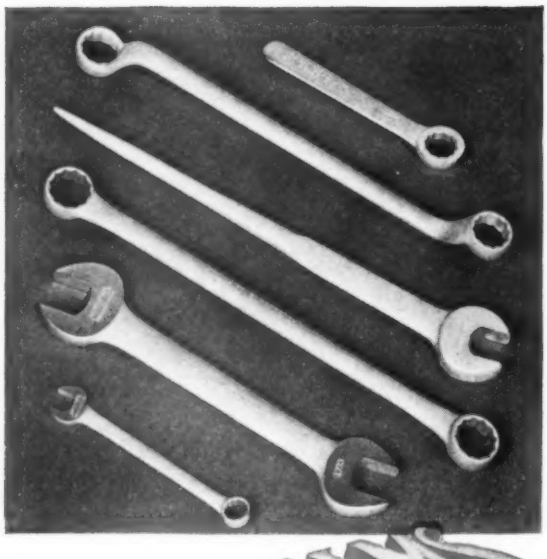
Ask P&J engineers to offer recommendations on your duplicate parts production so that you may know the savings possible with P&J Automatics.

POTTER & JOHNSTON MACHINE CO.

Pawtucket, Rhode Island



WILLIAMS "SUPERRENCHES"



● If you want the maximum in wrench strength and toughness with an absolute minimum of bulk and weight . . . your answer is a Williams "Superrench."

These fine wrenches are drop-forged from selected alloy steel and heat-treated, permitting trim, slim lines and exceptional balance. Made in a wide variety of patterns and sizes. Attractively finished in chrome-plate, over nickel, with highly-polished heads. Sold by leading Industrial Distributors everywhere.

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IMPROVE PROTECT ASSURE YOUR PRODUCT QUALITY!

Use G-E testing and measuring equipment *to find* and *to maintain* the highest standard of quality for your product. Easy-to-use and designed for accurate high-speed production results, these instruments often provide a solution to problems previously unsolved or a shorter more economical procedure to replace old methods.

Our engineers are qualified to discuss and to help you adapt G-E testing and measuring equipment for individual applications. Just call or write your nearest G-E office. *Special Products Division, Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

CHECK YOUR CONTAINER AND HELP ELIMINATE SHIPPING DAMAGE . . .

This scientific testing device . . . *the G-E puncture tester* . . . is used by many companies to make sure their shipping containers are the best obtainable to protect their product. By testing the puncture resistance of available container materials, you can discover which one is the most economical for your product shipping requirements. Write for Bulletin GEA-4168.

TEST INSULATION AND PREVENT FAULTY OPERATION . . .

With a small portable *G-E insulation-resistance meter,* insulation material can be tested during the manufacturing process and corrected before it leaves the factory . . . giving you a headstart on product reliability. With a range of 0 to 20,000 megohms, this instrument is suited to research study of temperature and humidity effects. In addition, insulation of already installed equipments can be checked with the insulation-resistance meter, to lessen any possibility of faulty operation. More about this device can be found in Bulletin GEA-4174.

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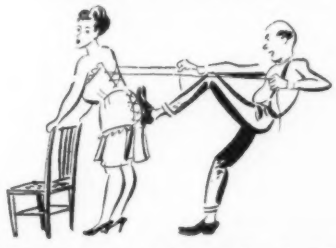
This kit of *G-E standard roughness specimens* offers you an easy method of specifying the necessary degree of roughness for your machined parts. Used by engineers, draftsmen, planners, machine operators, and inspectors in many plants, this device shows the standardized degrees of roughness on ten small metal blocks which can be removed from the case for easy comparison with the material being inspected. Overcome too lax or too strict inspection by taking the guesswork out of roughness standards. For complete information, write for Bulletin GEA-4335.

STRAIN CONTROL GUARDS AGAINST COLLAPSE . . .



Protect your machinery by installing a compact *G-E magnetic-strain gage* to prevent overloading. G.E. builds two types of strain gages: one for measuring slowly varying strain and the other for measuring rapidly varying strain. For laboratory, test, and factory use, this gage is economical, portable, and can be used repeatedly. For information, send for Bulletin GEA-3673.

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- ☐ GEA-4173—Light measuring equipment (Luximeter)
- ☐ GEA-4390—Mercury-vapor detector
- ☐ GEA-4618—Metal detectors
- ☐ GEA-4169—Magnetic comparator
- ☐ GEA-4435—Reflection meter
- ☐ GEA-4166—Repeated-scrape abrasion tester
- ☐ GEA-3573—Resistance comparator
- ☐ GEA-3151—Sound-level meter
- ☐ GEA-3680—Spectrophotometer
- ☐ GEA-4335—Standard roughness specimens
- ☐ GEA-4324—Tachometers
- ☐ GEA-4151—Time-interval meter
- ☐ GEA-4313—Vacuum gages
- ☐ GEA-4091—Vibration-fatigue equipment
- ☐ GEA-3618—Viscosimeter
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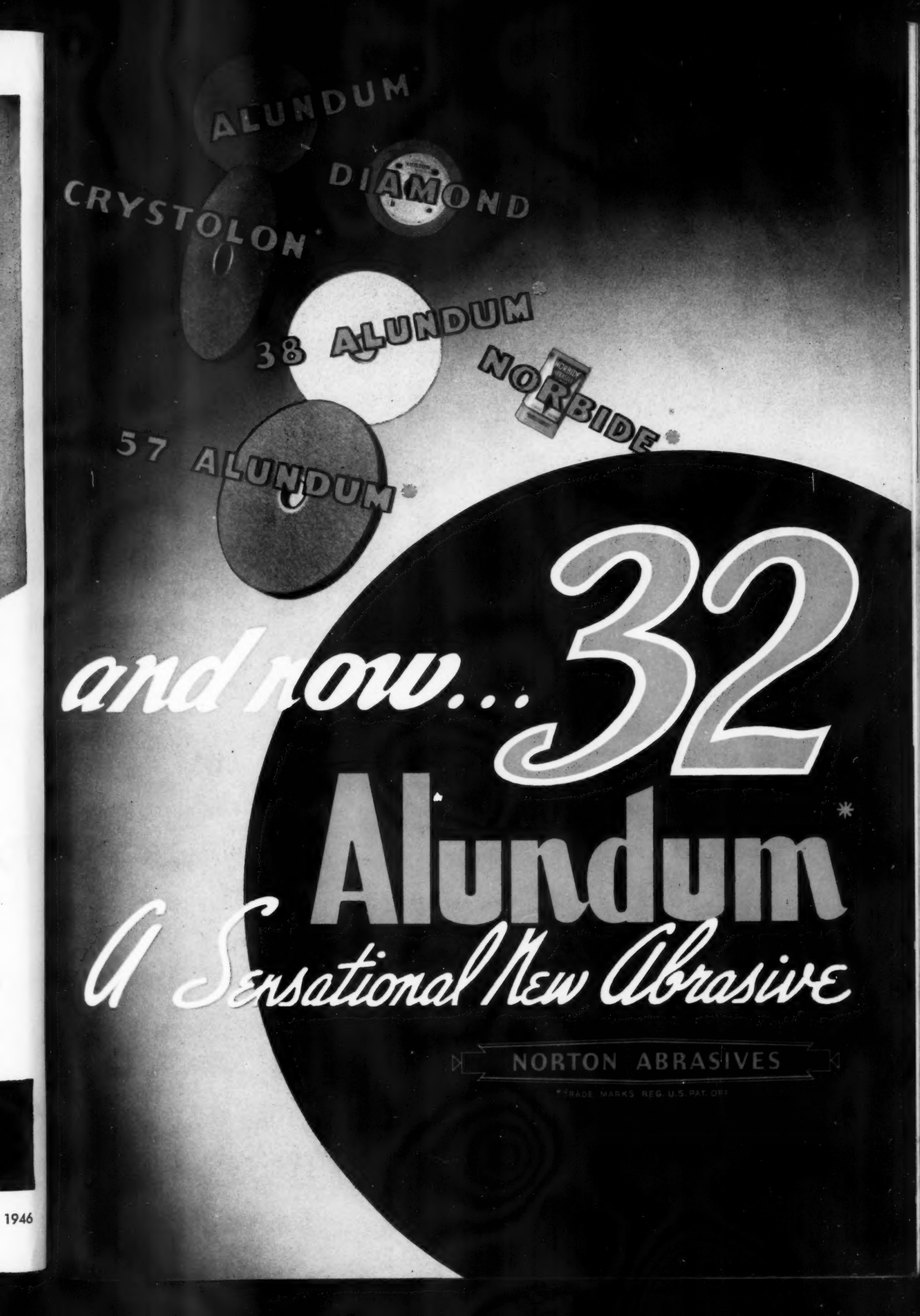
The UNION LINE

TWIST DRILLS
MILLING CUTTERS
REAMERS
HOBS
SLITTING SAWS
END MILLS
TAPS
DIES
SCREW PLATES
PROFILE CUTTERS

UNION


ALUNDUM
DIAMOND
CRYSTOLON
38 ALUNDUM
NORBIDE
57 ALUNDUM
and now... 32
Alundum*
A Sensational New Abrasive
NORTON ABRASIVES
*TRADE MARKS REG. U.S. PAT. OFF.

The Most Important Development since NORTON introduced in 1901

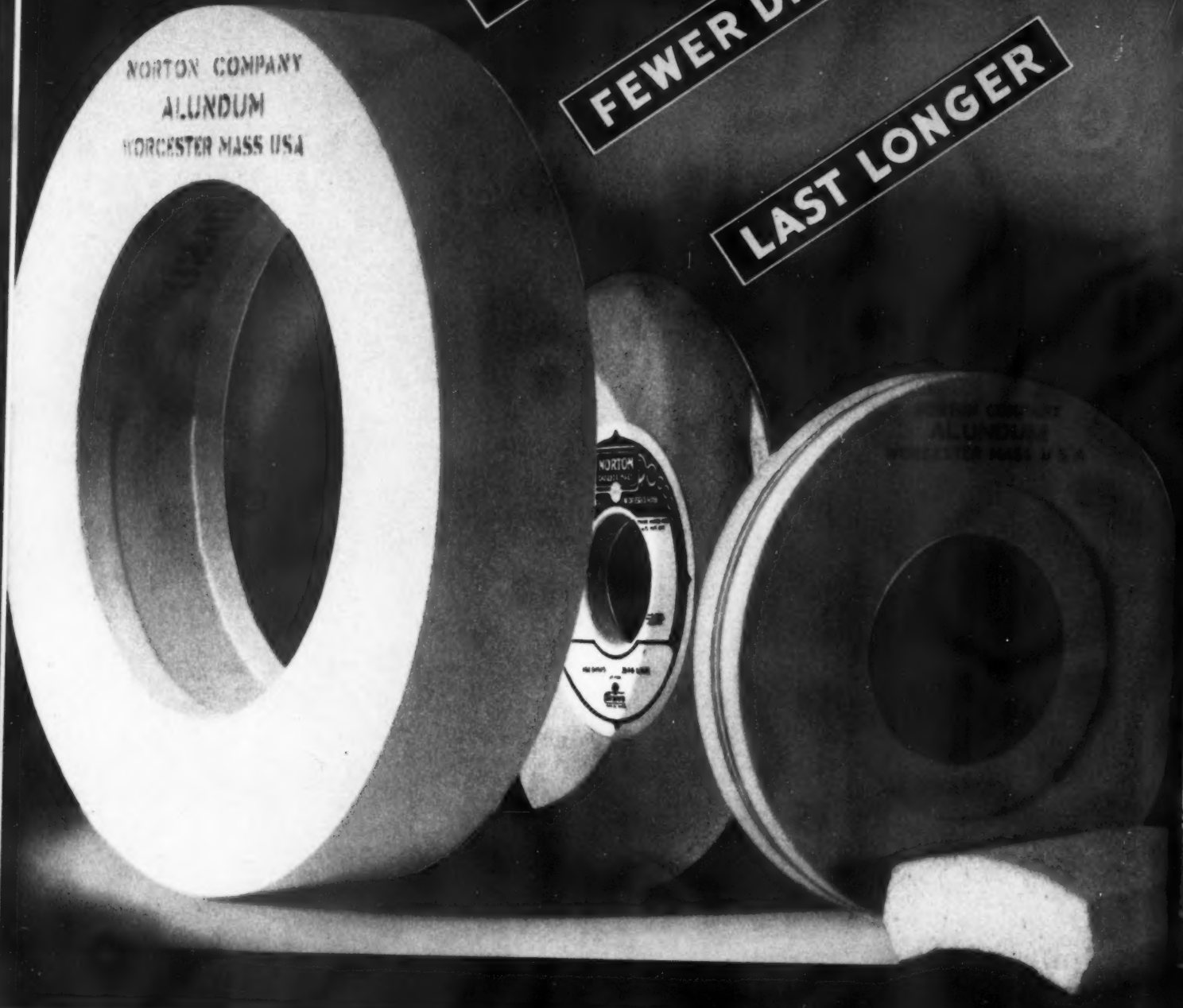
the original Electric-Furnace-Made Aluminum Oxide Abrasive (ALUNDUM*)!

CUT FASTER

CUT COOLER

FEWER DRESSINGS

LAST LONGER



32 ALUNDUM ABRASIVE

WHAT "32" IS

An entirely new type of aluminum oxide abrasive.

Radically different in appearance.

Radically different in shape.

Made differently by a Norton-invented and patented process.

Each super-cutting grain is a single crystal — individually produced in the electric furnace — not crushed to size.

First and only abrasive with a sharp, nubbly surface for super cutting action.

The only abrasive which combines a strong grain structure with a cool cutting action.

WHAT "32" DOES

Cuts deeper and faster

Cuts freer without burning

Requires fewer dressings

Gives longer wheel life

Reduces grinding time

HOW "32" IS MADE

32 Alundum abrasive is made by a patented Norton process which creates single crystals of high purity in a fluid matrix in an electric furnace. Each crystal being separately formed has a strong, solid shape and many sharply pointed nubs. To retain these many sharp cutting edges the crystals are not crushed but are separated from the matrix by a complicated and continuous chemical process. They are then screened without crushing into the standard grain sizes. The great number and the sharpness of the nubs enable grinding wheels of 32 Alundum abrasive to penetrate metal deeper, cleaner and faster.

Stocks of Wheels For Surface, Tool and Internal Grinding Available Now

Tests on other types of grinding are in progress and the use of 32 Alundum wheels will soon be extended into other fields.

Here's a photomicrograph of typical grains of 32 Alundum abrasive. Note how they combine sharp cutting angles with a strong, solid shape. Note also the rough, nubbly surface that insures secure bonding.

NORTON ABRASIVES

Here Are a Few Examples of the Sensational Performance of

32 ALUNDUM GRINDING WHEELS

TOOL GRINDING
8 x ½ x 1½" — 32A54-K5VBE

"On cutters, reamers, and end mills of high speed steel and molybdenum steel it cut faster and gave better finish than previous wheel without discoloring the work. Held corner better and cut much cooler."

TOOL GRINDING
7/5 x 2 x 1¼" — 32A54-J5VBE

"Cut cooler and faster than any wheel ever tried. Adopted in place of competing wheel."

SURFACE GRINDING
12 x 2 x 5" — 32A46-G8VBE

"Best wheel ever used on high carbon, high chrome steel. Removed .002 to .003" of stock compared to .0005" with previous wheel. Longer life."

SURFACE GRINDING
Segments in Norton Chuck
32A36-E12VBEP

"Much better than competing product. Cut cool and fast—less burn, little dressing, life three times longer."

INTERNAL GRINDING
¾ x ¾ x ⅜" — 32A60-J8VBE

"Most outstanding internal wheel ever used at this plant. Cut six times faster, or .003" per pass compared to .0005". Excellent finish. Life tripled. No dressing required."

ENTHUSIASTIC reports like these are coming in from plant after plant where 32 Alundum wheels have been tested. Now you can enjoy the same outstanding performance on your surface, tool and internal grinding jobs.

Because 32 Alundum grinding wheels are so sharp compared with other wheels a change in grade or in grain size is often necessary when making conversions. Your Norton abrasive engineer or distributor's abrasive specialist will be glad to give you the proper 32 Alundum wheel specifications. Or write to the Sales Engineering Department giving full information about your jobs, including the specifications of the wheels now being used.

NORTON COMPANY, WORCESTER 6, MASS.

New York - Detroit - Chicago - Cleveland - Pittsburgh
Philadelphia - Denver - Los Angeles - Hamilton, Ontario

Behr Manning Corporation, Troy, N. Y. is a division of Norton Company

10-46

Printed in

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The Army and Navy are studying our natural caves, such as Carlsbad and Mammoth, in order to determine their usefulness as war-time shelters for industry.

get ready with CONE for tomorrow

Weirton Steel Co. now pipes oxygen around its plant like water.

get ready with CONE for tomorrow

Centrifugal casting of plastics is claimed by Rezolin Co. of Beverly Hills to offer the same advantages that the process does to the casting of metal.

get ready with CONE for tomorrow

Dow Corning has tested paints made from silicone resins and aluminum powder on diesel manifolds and furnace doors at temperatures as high as 600 degrees Fahrenheit.

get ready with CONE for tomorrow

A joint committee of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers has standardized the sizes of large steam turbines and the first standard unit for electric power generation is now under construction.

get ready with CONE for tomorrow

Federal Telephone and Radio Corp. claim that their new small-size selenium rectifier can replace as many as 29 different rectifier-type tubes now used in radio receivers.

get ready with CONE for tomorrow

International Business Machine Corp. is offering the Chinese a typewriter that will print 5,400 ideographs by the use of 43 keys. An experienced user can write about 45 words per minute (English record 149).

get ready with CONE for tomorrow

American Steel and Wire Co. has a quarter-inch nail that can be used to tack tags to cold steel ingots.

Texaco has developed a new synthetic grease for aircraft instruments, controls, cameras and small motors that is usable from 100 degrees below zero to 300 degrees above.

get ready with CONE for tomorrow

Recent tests indicate that the new railroad car stabilizer, developed by Westinghouse from the gyroscopic tank gun mount, shows great improvement in riding comfort over all kinds of roadbeds.

get ready with CONE for tomorrow

Welded tubular chassis, helical springs, independent axles, 1000 pounds less weight and a lower powered engine are among the details of the proposed new low-priced Chevrolet.

The new Duco Metalli-Chrome automobile lacquer uses particles of aluminum to give a metallic luster and is made in 200 colors.

get ready with CONE for tomorrow

Slight bends in the last threads of a new lock nut made by Grip Nut Co. permit it to turn freely through most of its travel, yet prevent it from loosening when finally set up.

get ready with CONE for tomorrow

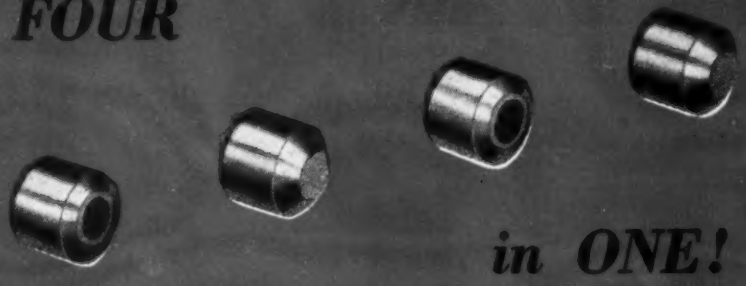
United Engineering and Foundry will pour a 243-ton casting for a press base which will take one month to cool and another month to anneal.

get ready with CONE for tomorrow

University of California scientists have produced a standard for the measurement of length ten times as accurate as the cadmium light ray now accepted by using a light wave from transmuted mercury (made from gold) excited by a high frequency radio beam.

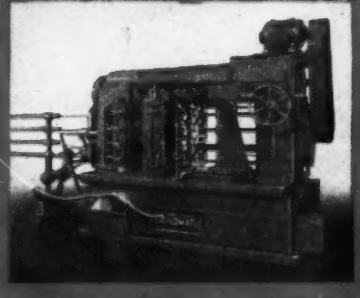
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

FOUR



in ONE!

Four parts machined in the time for one is *profitable* production.
The set screw blanks shown are made from SAE-3135 bar stock within the time and precision specified—and *four* at a time.
Why not investigate the *profitable* adaptation of the Conomatic VERTICAL to work in your shop? Write for literature.



Ask your* CONE *representative to show you our new color motion picture

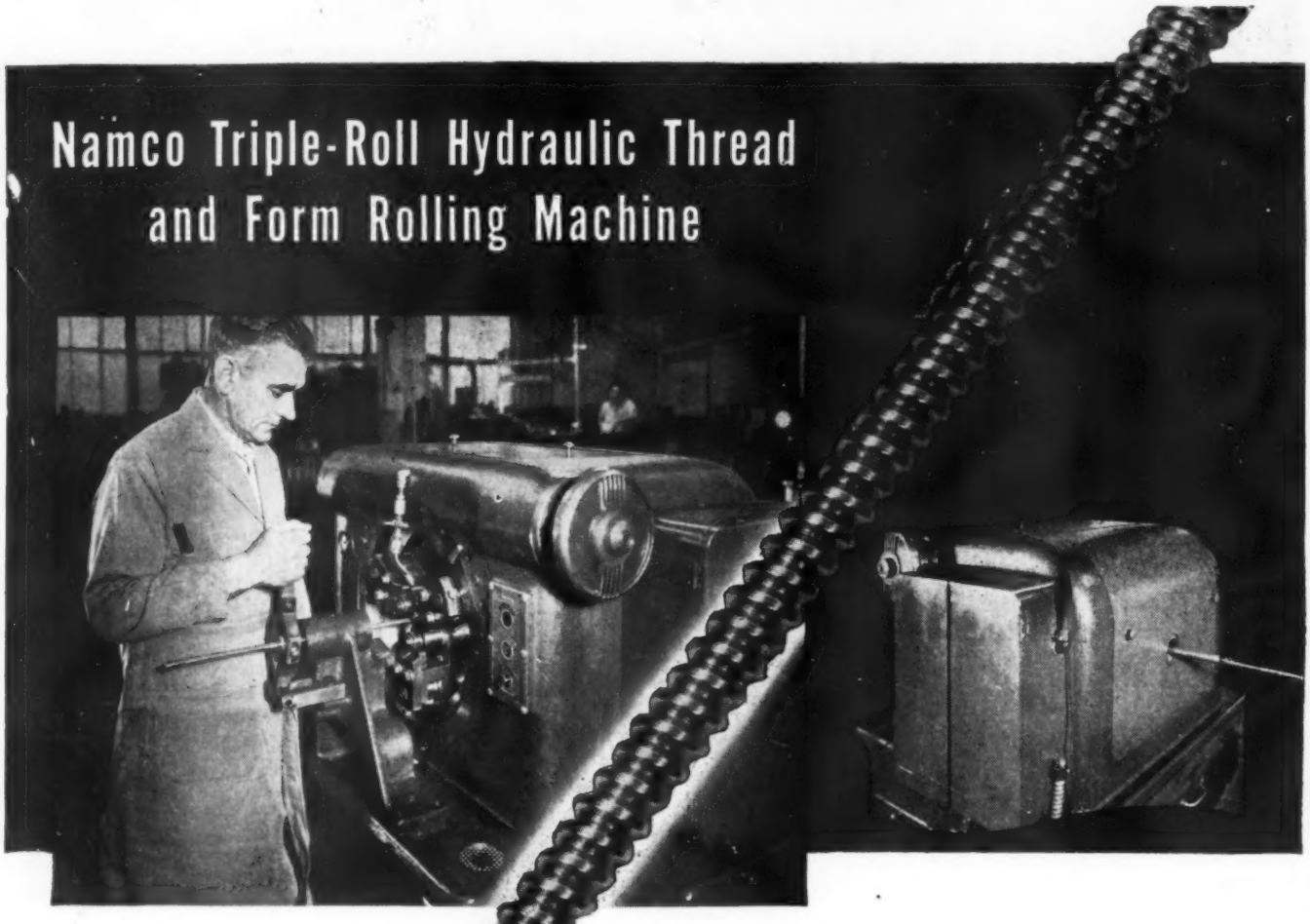
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

34

FOR HIGH-SPEED PRECISION THREAD-ROLLING

Namco Triple-Roll Hydraulic Thread and Form Rolling Machine



The Namco Thread Roller has *three* rolls, backed up by powerful straight line camming—for positive, equalized pressure. The result is a smoother thread, closer fit—and *no* distortion, even on hollow work.

THREADS 3 FEET LONG, ROLLED TO A CLASS 3 FIT

That's the kind of work you can do on the Namco Triple-Roll Hydraulic Thread & Form Rolling Machine—in addition to the general range of jobs in all standard pitches and in sizes from 3/8" to 1½". Operation is simple, dependable—and *versatile.* May we show you how thread-rolling the Namco way can fit your requirements?

COMPLETE DETAILS are contained in this new eight-page folder. Write today for your copy.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR AND CHUCKING AUTOMATICS: 1-4-6 AND 8 SPINDLE • HYDRAULIC THREAD ROLLING MACHINES AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

You can thread 3 times as many holes WHEN YOU USE AN Electrolized TAP

Here's the secret

High speed steel taps of the finest quality, accuracy and workmanship are *electrolized* by a new scientific process that combines high voltage with a chemical bath and a rare metal.

The result — a tap cased with an extremely tough alloy which multiplies wear resistance, reduces chip and surface friction, produces cleaner threads, and *holds size much longer*. Chip weld is minimized.

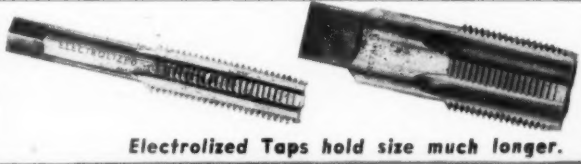
Try *Electrolized* Taps on *your* work under *your own* operating conditions. See what they'll do for you in terms of cleaner threads and more holes at lower cost.

Quality and performance can't be talked into a tap; production costs can't be lowered by words. Use alone will prove that you can get three times as many cleaner threaded holes with an *Electrolized* Tap. Some users tapping brass or aluminum are getting *ten times* as much performance.

Think what this can mean to you in terms of increased production and lower cost per threaded hole.

• • •

Electrolized Taps are sold only through top grade mill supply distributors. Let us give you the name of the one nearest you and mail you our Bulletin containing complete information and prices on all styles and sizes of *Electrolized Taps*.

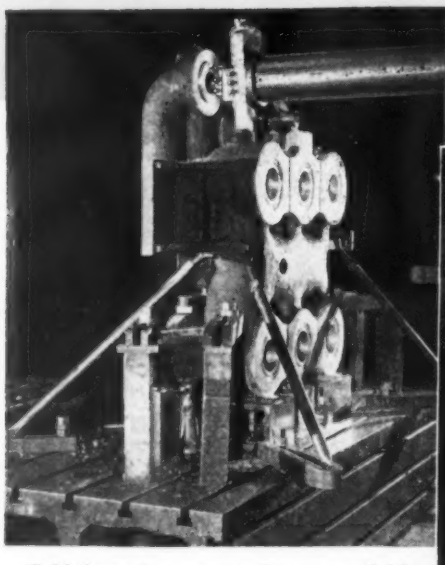


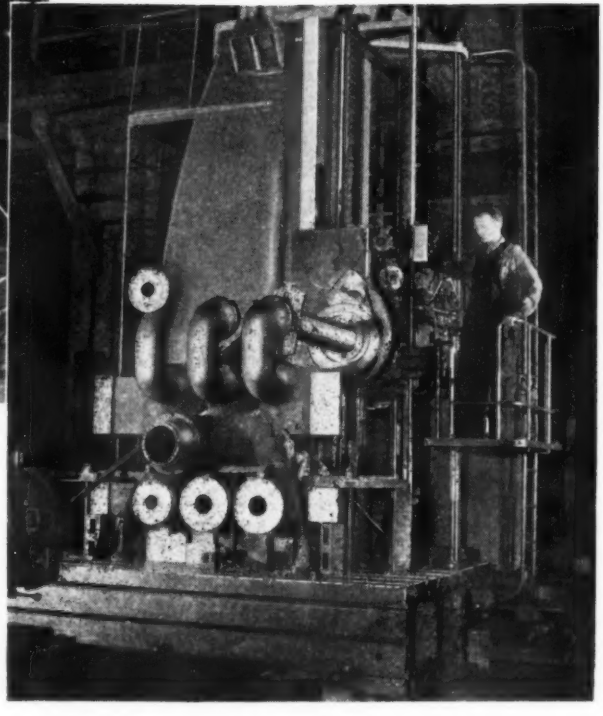
Electrolized Taps hold size much longer.

Electrolized TAP CORPORATION
148 WEST RIVER STREET
PROVIDENCE 1, RHODE ISLAND

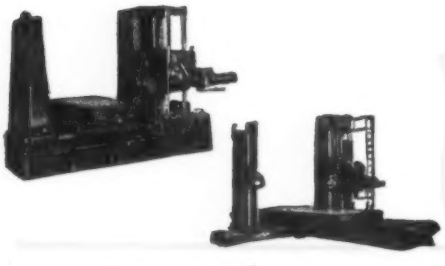
FEWER SET-UPS REQUIRED TO MACHINE THESE LARGE, *odd-shaped pieces* on a G.&L.

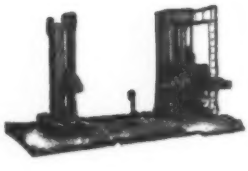
Over-all Time Sharply Reduced by Performing Boring, Drilling, Milling and Other Operations in Sequence with Minimum Work Handling



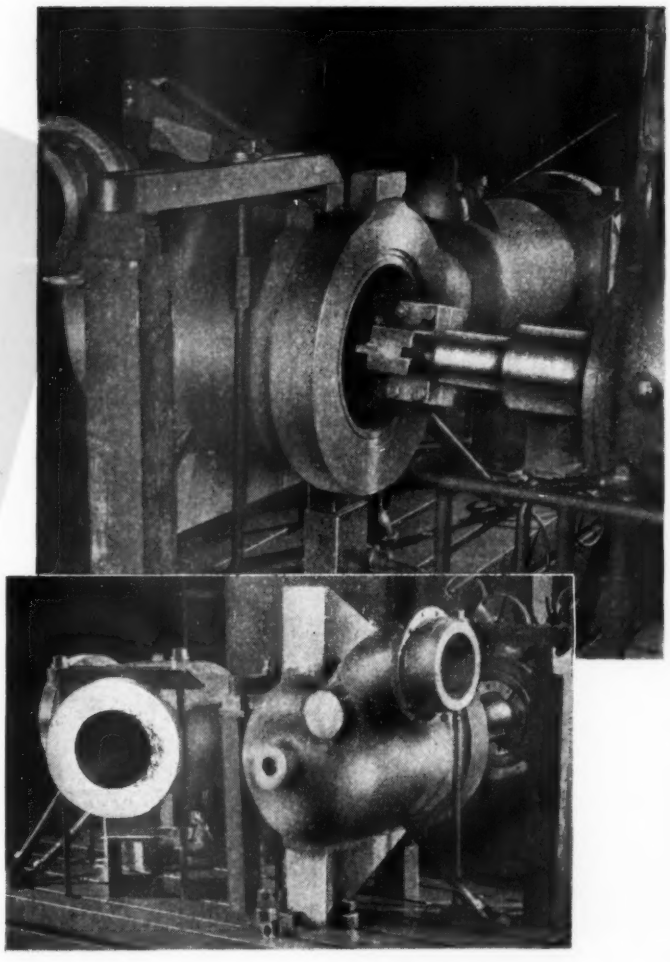


Odd-shaped steam turbine manifold being machined without difficulty on a G. & L.





G&L *Giddings*



LEFT—Boring steam throttle valve port. Several machining operations have already been completed on this part.

LEFT, BELOW—Cast steel two-piece steam throttle valve weldment mounted on box type parallel.

Machining Time Cut from 70 to 50 Hours on Steam Throttle Valve Body

This weldment composed of two steel castings presents an intricate machining problem where a series of milling, drilling, boring, facing and counterboring operations must be performed. The part is both difficult to hold and hard to approach. Open construction of the G. & L. simplifies these two difficulties. Mounting the valve body on a box parallel makes it possible to move the complete unit in any desired position for machining. This simplified handling saves 20 hours over the previous method.

Unusual shaped castings and fabricated parts may be completed faster and more accurately when work settings are reduced to a minimum. Merely by changing cutting tools, numerous boring, drilling, milling, tapping and facing operations are readily performed with the Giddings & Lewis horizontal boring machine. Often many complicated machine components are completed in one setting of the work. Floor-to-floor time is sharply reduced because it is unnecessary to move the work to single-purpose machines and reset it for individual operations.

Submit Difficult Machining and Work Handling Problems to G.&L. Engineers for Recommendations

Experienced Giddings & Lewis engineers are constantly assisting others in solving difficult machining and work handling problems. They are in a position to recommend machines or accessories which will help end job troubles and at the same time produce more parts for you at greater profit. Ask for their help now—there is no obligation.

AVAILABLE FOR YOUR USE...

Free

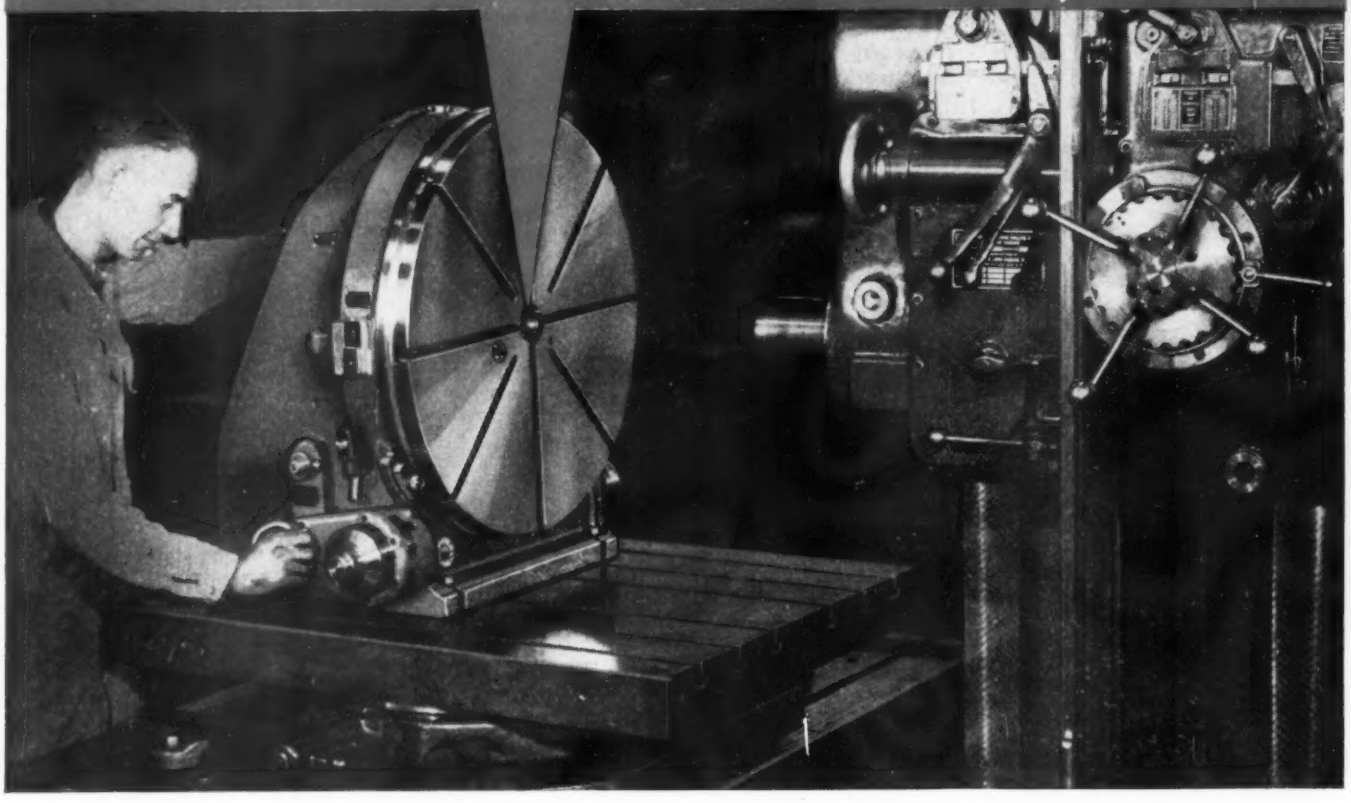
PERFORMANCE INFORMATION

G. & L. machining facts are presented in folder form. Write now for these profitable ideas. Ask for Production Data Folder AM106.

G. & L. MACHINE TOOL CO.

138 DOTY STREET • FOND DU LAC, WISCONSIN

UPRIGHT *Accuracy*



HIGH PRECISION ASSURED WITH P&W 30" VERTICAL ROTARY TABLE

Angular spacing to jig borer precision can be obtained . . . index and angle boring of any type can be handled efficiently and accurately—by using the 30" Precision Vertical Rotary Table on a horizontal boring mill. The Table is also ideal for inspection checking where accurate measurements are paramount in checking concentricity, index, or angle of parts.

The Table rotates 360° in a vertical plane and workpieces up to 30" in diameter can be mounted on it. It is a valuable addition to the well-equipped tool shop. Tool engineers recognize its high-precision accuracy and use it on innumerable indexing and checking jobs.

Complete information on the P&W 30" Precision Vertical Rotary Table will be furnished on request to your nearest Pratt & Whitney Branch Office.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

Birmingham • Boston • Chicago • Cincinnati • Cleveland • Detroit • Los Angeles
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Brown & Sharpe Spiral End Mills cut *FASTER*, more *FREELY* and require *LESS POWER*

Hollow face and angle of rake

Produced by a generating process which reduces the danger of grinding burns, these edges cut more pieces per sharpening. The angle of rake reduces power consumption.

Correct number of teeth

Tooth design permits use of fewer teeth which increases cutting efficiency and enables teeth to be made much stronger with greater chip space.

Stronger teeth

The use of a double angle land, giving the desired cutting clearance without danger of the heel of the land rubbing on the work, makes these stronger teeth practical.

Correct helix angle

Two types of helix angle provide smooth cutting action . . . a small helix angle for teeth of two lipped spiral end mills for accurate milling of slots and a steep helix angle for teeth of both regular and two lipped end mills for smooth, fast-cutting action on general milling work.

Fine design features and skilled manufacture give these end mills the qualities essential for fast production. The clean-cut chips with little discoloration – not compressed – not misshapen–are visible evidence of clean cutting action – ability to take many cuts between sharpenings with a long cutter life. Brown & Sharpe End Mills will produce more work for you at lower cost. Write for literature. BROWN & SHARPE MFG. CO., Providence 1, R. I., U.S.A.

B·S

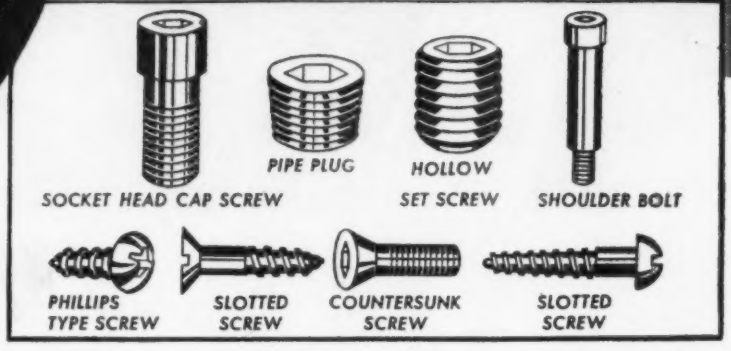
We urge buying through the Distributor

BROWN & SHARPE CUTTERS

BITS

FOR DRIVING ALL THESE SCREWS

Handle is molded of sturdy Celanese* plastic; tools are of high grade alloy steel



Contained in this Handle

HALLOWELL

"SOCKET SCREW" KIT

with interchangeable bits

For men who like to have a complete supply of tools, yet dislike bulk and confusion, the Hallowell "Socket Screw" Kit is the answer. It is one of the neatest tricks of the year. The hollow Celanese* plastic handle holds interchangeable bits for most all purposes . . . Phillips, Hex and Flat. There is a swivel bit-chuck, which locks securely in position, and makes it possible to twirl a screw using the vertical position, and then snapping the chuck to an angle or ell position, to get the final tightening pull.

Not illustrated: "Socket Wrench" Kit; the "Auto" Kit; the "Home" Kit. Write for our 8-page booklet that fully describes these handy Tool Kits. Obtainable at Suppliers throughout the country.

If your Supplier does not carry these Kits, send his name to us, along with yours, and you will be taken care of promptly.

Kits: Patents Pending

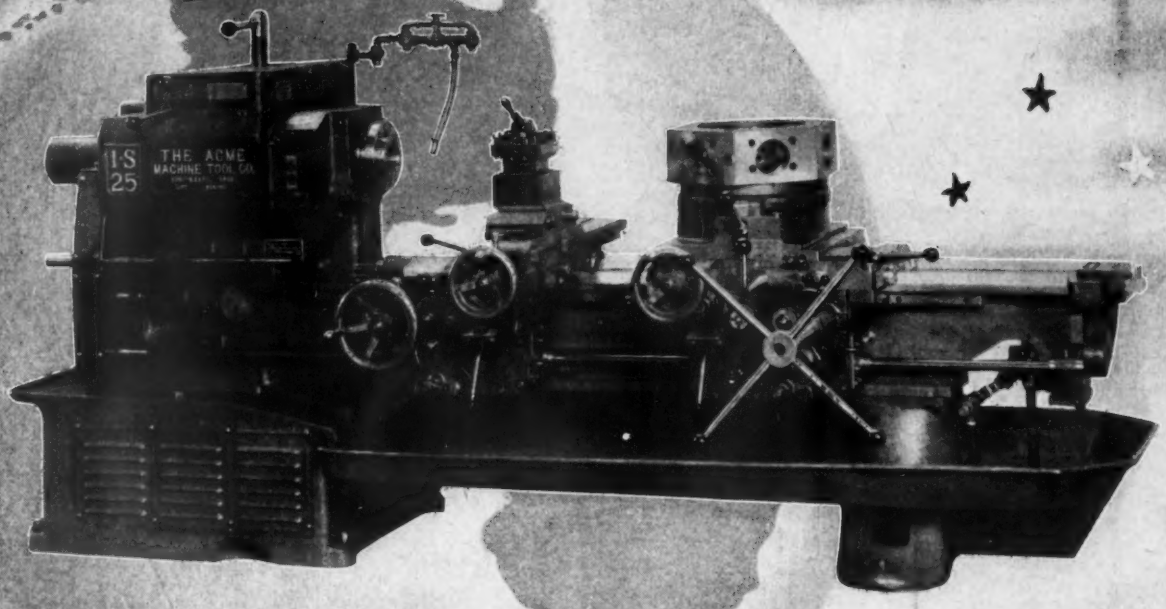
OVER 43 YEARS IN BUSINESS

*Reg. U. S. Pat. Off.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

FAMOUS THE WORLD OVER
THE ACME TURRET LATHE



The Acme Turret Lathe is the machine with a future. In the production of today and tomorrow Acme takes a high place. Power—Speed—Rigidity—Accuracy—Durability—5 keynotes of the Acme Turret Lathe that insures top production for years to come.

★ **BUILT TO LAST**

★ **DESIGNED FOR THE FUTURE**

WRITE US FOR
COMPLETE INFORMATION

THE ACME MACHINE TOOL CO.
CINCINNATI 32, OHIO

Gentlemen: Please send me without obligation Engineering data, bulletin, etc.

NAME_____

COMPANY_____

ADDRESS_____

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

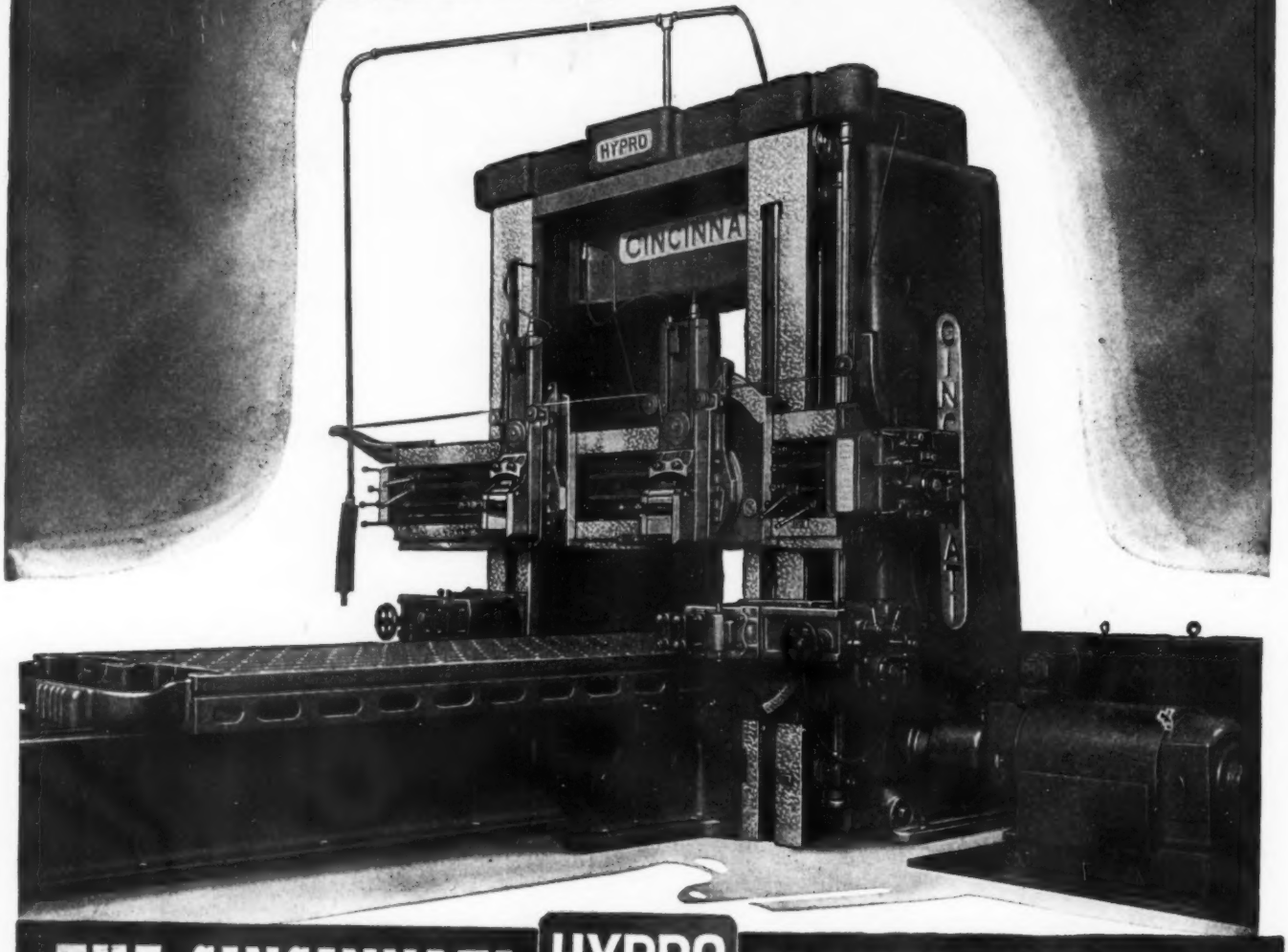
CINCINNATI

HYPRO

72" x 72" x 20' HYPRO DOUBLE HOUSING PLANER

Manufactured in all sizes from 24" to 120", inclusive

Modern, proven design Cincinnati Hypro Planers are furnished with many new patented or exclusive Hypro-Duction features such as all-steel hardened twin herringbone gear train, selective steering dial feed and power rapid traverse to all heads, forced lubrication to vees, guides, gear train and bearings, double nuts bushed with special bronze, furnished on both saddle and down slide screws. Full bearing vertical and cross dovetail, reinforced double-acting tool block abutments, centralized dual saddle control with precision adjustable bearing

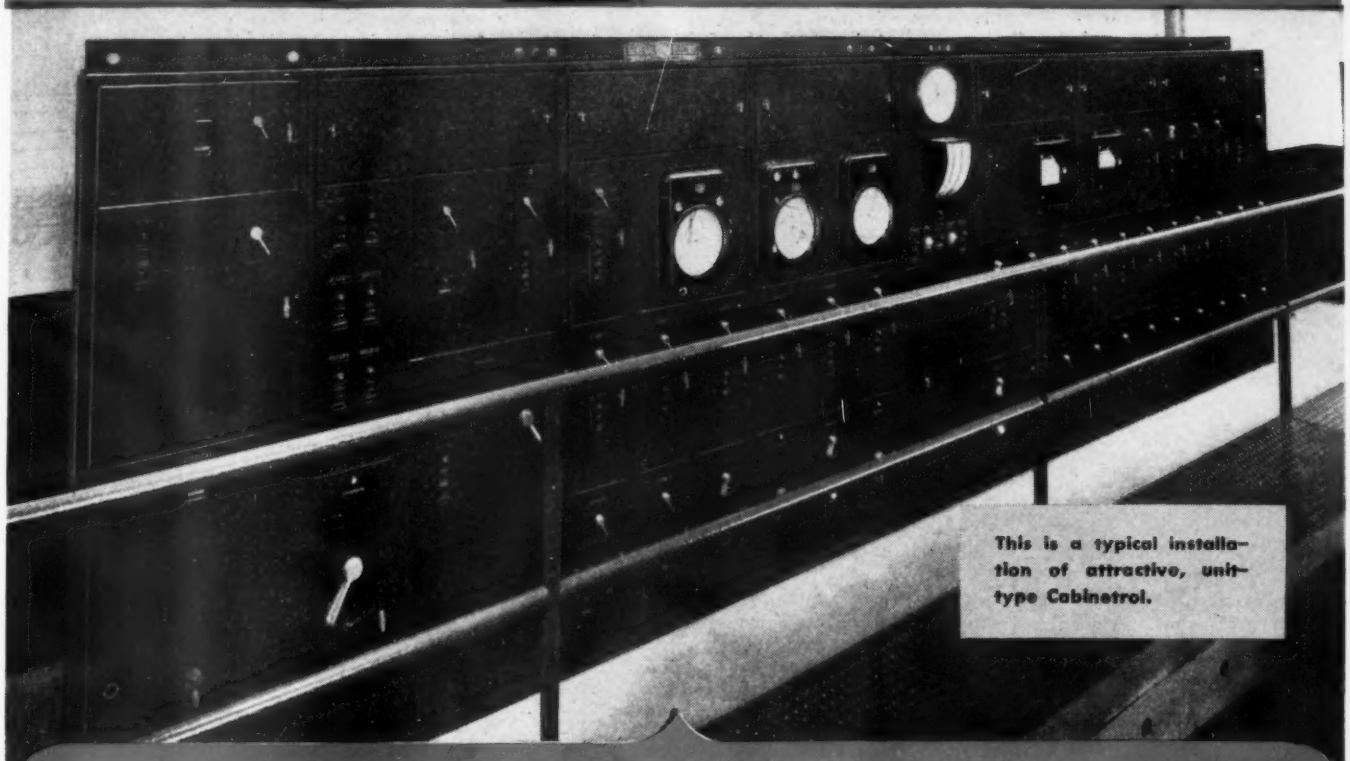


THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

HODGE-PODGE CONTROL IS EXPENSIVE!



This is a typical installation of attractive, unit-type Cabinetrol.

Trim, Modern CABINETROL Cuts Installation Time and Cost

Rambling, space-taking racks are a thing of the past. Control in the *modern* plant is compact, centralized G-E Cabinetrol. It's attractive in design, safe to operate, and it costs no more!

Cabinetrol saves installation time and expense because it's a single, self-supporting unit. No cumbersome frames—no cluttered walls. Just one attractive, all-metal unit that will greatly enhance the appearance of your mill.

The savings in installation cost that you get with Cabinetrol usually far outweigh its higher original cost. Only two operations are necessary—placing the unit in the designated location and connecting external power, motor, and control leads.

IT'S PRE-ENGINEERED

Cabinetrol is based on the use of standard enclosures equipped with the right combination of standard control devices. Each unit is pre-engineered to meet your specific requirements. All starters and accessory equipment necessary to your application are incorporated in the Cabinetrol unit before it is shipped.

PROTECTS YOUR OPERATORS

Because metal-enclosed Cabinetrol is completely deadfront, it offers your operators and servicemen maximum protection. Each motor control is installed in an individual sheet-steel compartment with an interlocking door. Operating mechanisms for motor-circuit switches and air circuit-breakers are available from the front of the panel.

LET US HELP YOU equip your plant with co-ordinated control. We'll be glad to work with you now—to provide a Cabinetrol system specially engineered for your plant—and, if you desire, to help you fit Cabinetrol into your over-all plans.

If you'd like more facts about Cabinetrol ask for Bulletin GEA-3856. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

G-E INDUSTRIAL CONTROL

GENERAL ELECTRIC

We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES

The New HARDINGE High Speed Precision Second Operation Machine

HARDINGE
ELMIRA, N.Y.

Features:

1" Collet Capacity
6" Step Chuck Capacity
5" Jaw Chuck Capacity
Speeds to 4000 r.p.m.

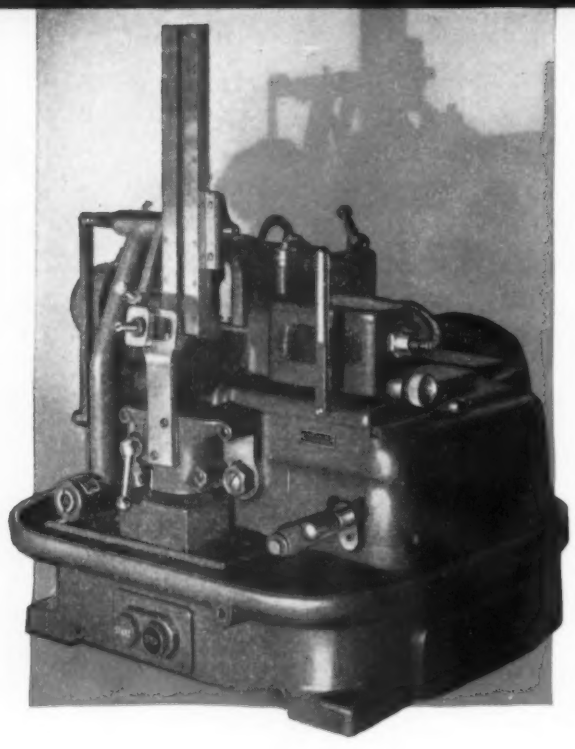
The above features assure sustained accuracy. The performance features of the previous model have been retained. This is the outstanding machine for high speed production of second operation work. Ask for bulletin DSM 59.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

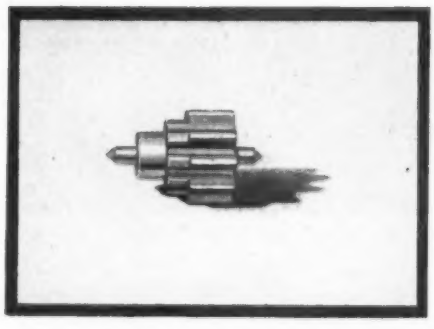
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS



TYPE "S" HOBBING MACHINE PRODUCES SMALL GEARS IN LARGE QUANTITIES *Automatically*



This small hobbing machine has magazine loading and a completely automatic cycle which includes loading into and unloading from working position. Its capacity is 1" diameter and ½" face, and it is designed for hobbing gears and pinions (spur form only) of the fine and extra fine pitch classes ranging from 30 to 200 D.P. Production capacity is high and accuracy is excellent, as exemplified by the small pinion illustrated, which is produced at the average rate of 143 per hour. O.D. and P.D. are held within .0015", eccentricity from O.D. to pivots within .0005", and runout to less than .001". Barber-Colman manufactures small fine-pitch hobs (up to 200 pitch ground and 250 pitch unground) for use on this machine. *When you need small gears in large quantities — use the Barber-Colman Type "S" Hobbing Machine and Barber-Colman Fine Pitch Hobs.*

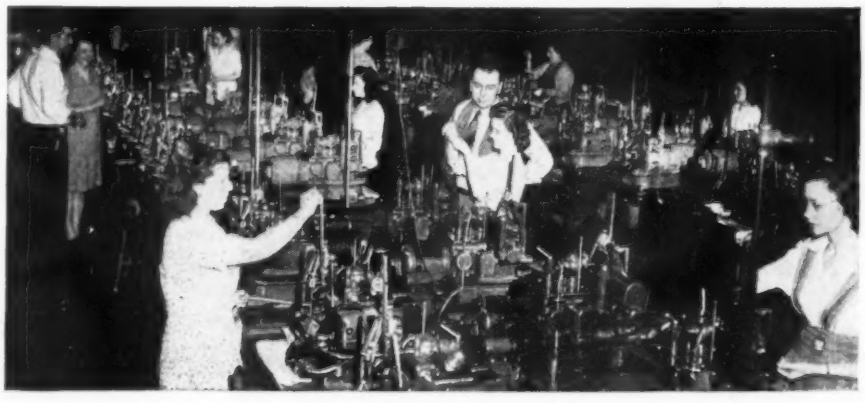
JOB FACTS ON THIS PINION

PIECE. Clock type pinion, .250" overall length, .1578" O.D., .1039" face, 9 teeth, .0481" C.P., clock tooth form. Material is WD1112 steel.

SET-UP. Automatic cycle with magazine loading. Pinion held on pivots between centers. Hob speed 928 r.p.m.

PRODUCTION. Cutting time 25 sec., 143 per hour at 85% efficiency, including down time. Hob produces 2500 pieces per grind, 30,000 pieces for full life of hob.

The pinion shown above is one of many similar types being produced in this department equipped with 73 Barber-Colman Type "S" Hobbing Machines. Nine operators take care of this whole battery.



BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

Van Keuren MEASURING WIRES

STANDARD EQUIPMENT *Everywhere*

Measuring the pitch diameter of a 1"—8 National Form thread gage with three wires. This method is recommended by the Bureau of Standards.

Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, worms, splines and gears.

Reputable manufacturers of the ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded male parts.
Price, High Speed Steel Wires $ 95.00
Price, Carboloy Wires $240.00
Special wires from .002" to 1.510" diameter—prices on application.

Set No. 20 Thread Measuring Wires.

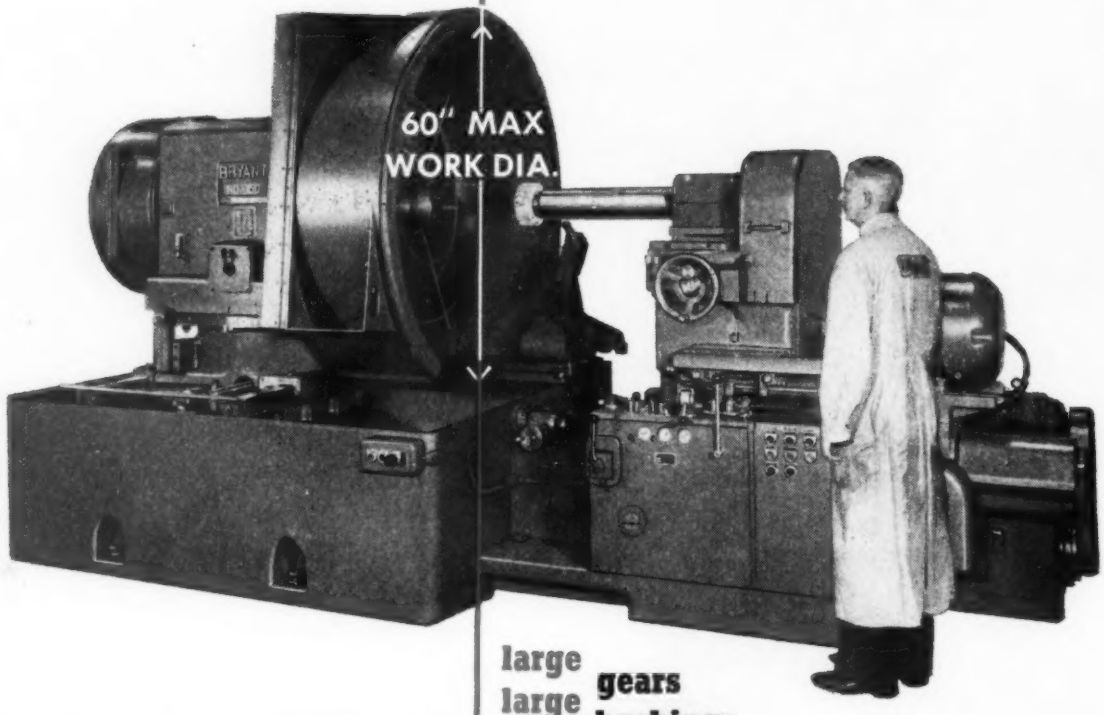
It is easy to use Van Keuren wires. The Van Keuren handbook, "Precision Measuring Tools" gives complete tables and simplified formulas for measuring standard and special threads, splines, gears and worms. Send for this valuable 160-page handbook No. 33.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

27th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

NEW No. 150 HYDRAULIC INTERNAL GRINDER



large gears
large bushings
large bearings
large dies, etc.

Another Bryant Postwar Development for

The new No. 150 grinder is a great Bryant postwar achievement to vastly increase the internal grinding capacity of your plant. This big machine is easily controlled and produces the finest finish on gears, bushings, castings, etc., *up to 60" in diameter.* The many functional features of the new No. 150 assure extremely accurate work on a high production basis. The famous Bryant three point wheel slide suspension is basic and closely maintains wheel alignment at all times. A preloaded anti-friction cross-slide insures smooth hand and power cross feed, and a hydraulically retractable wheel slide simplifies the loading and unloading of parts. The work spindle is designed for the mounting of work fixtures on either end, and is hollow to facilitate the chucking of special spindles or long work.

In a single chucking, the new No. 150 can grind a bore, or a bore and face—the bore may be either straight or tapered. When grinding a face and straight bore the new No. 150 is particularly advantageous because it assures maintenance of squareness between bore and face. Outside diameters, or outside diameters and faces can also be finished in one chucking. A copy of the new catalog sheet giving full details is yours for the asking.

If you have internal grinding work in the range from 1/16 inch diameter bore to 60" diameter swing, Bryant has machines that will economically meet your requirements. It will pay you to—

Send for the man from Bryant.

BRYANT

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

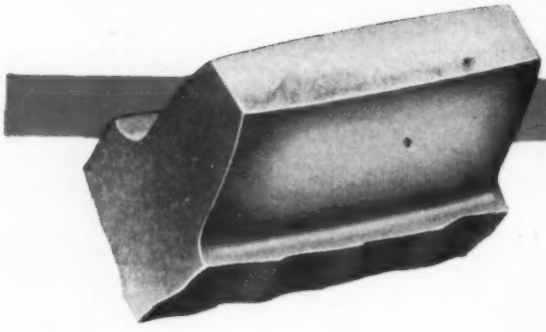
LOOK what they're doing with
ALCOA ALUMINUM SCREW MACHINE STOCK

More and more manufacturers of screw machine products are recognizing the advantages of Alcoa Aluminum Screw Machine Stock. Its economy means lower cost—greater profits. It can be worked at top machine speeds. It produces a fine finish. Prices are lower than pre-war. And—there's plenty available, assuring prompt shipment. Phone Alcoa's nearby office.

ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pa.

ALCOA FIRST IN ALUMINUM

ELLIPTOID TEETH for the Modern HEAVY DUTY GEAR



The Elliptoid tooth form has a very important function. It confines operating load concentrations to the strong central region of the tooth and prevents such concentrations at the ends of the tooth where it is weakest and therefore most vulnerable to failure.

The actual difference in tooth thickness between the ends and center of an Elliptoid tooth need be very little (.0003" to .0005" per inch of face) but when that difference is consistently maintained the tooth always develops its maximum operating strength.

The Elliptoid tooth form is developed on Red Ring Rotary Shaving Machines which, in addition, correct errors in tooth spacing, helical angle, profile, eccentricity and surface finish.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN — RED RING ◯ PRODUCTS — DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Want to increase your cutting speed 20% . . . ?

Truly amazing results . . . speeds and feeds never before possible, have become commonplace in plant after plant which has switched to Cimcool. For this revolutionary *chemical emulsion* combines friction reduction and cooling capacity in a degree never before attained.

and CIMCOOL also offers you . . .

- Uniform work temperature (increases accuracy).
- No fire hazard—No smoke—No slippery film.
- Chemical lubricity (increases tool life).
- Long-lasting rust inhibitor.
- Non-irritating—doesn't grow rancid.
- Covers 85% of all metal working jobs.

CIMCOOL DIVISION OF
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

STAPLES TOOL & ENGINEERING CO. INCREASED SPEEDS 1/5 WITH CIMCOOL

"On our various milling operations, we have been able to increase our feeds and speeds by approximately 20% due to the greater cooling qualities of Cimcool," writes Staples Tool & Engineering Co. of Cincinnati, O. This company's letter is typical of many in our files. We will gladly show you others. *Write today!*

CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

many a tough milling machine problem has been solved by a . . . KEMPSMITH distributor

He's got the

- ☆ FACILITIES
- ☆ EXPERIENCE
- ☆ TRAINING
- ☆ SKILL

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You'll like doing business with a Kempsmith Distributor! He understands milling machine problems and he's ready at a moment's notice to give you the benefit of his engineering skill, service facilities and broad technical experience. What's more, he is available when you need him, always dependable in the pinches. So, if you are confronted with a tough milling machine problem, just reach for your phone . . . call your nearest Kempsmith Distributor.

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MILWAUKEE 14, WISCONSIN, U. S. A.

KEMPSMITH

Precision Built Milling Machines Since 1888

This New Trend in DYNETRIC* BALANCING

CUTS HANDLING COSTS TOO!

● Handling is a cost item to reckon with wherever you find it.

Here is one of the ways Gisholt is solving this problem in the Dynetric Balancing of many parts—as well as in the balancing of complete assemblies.

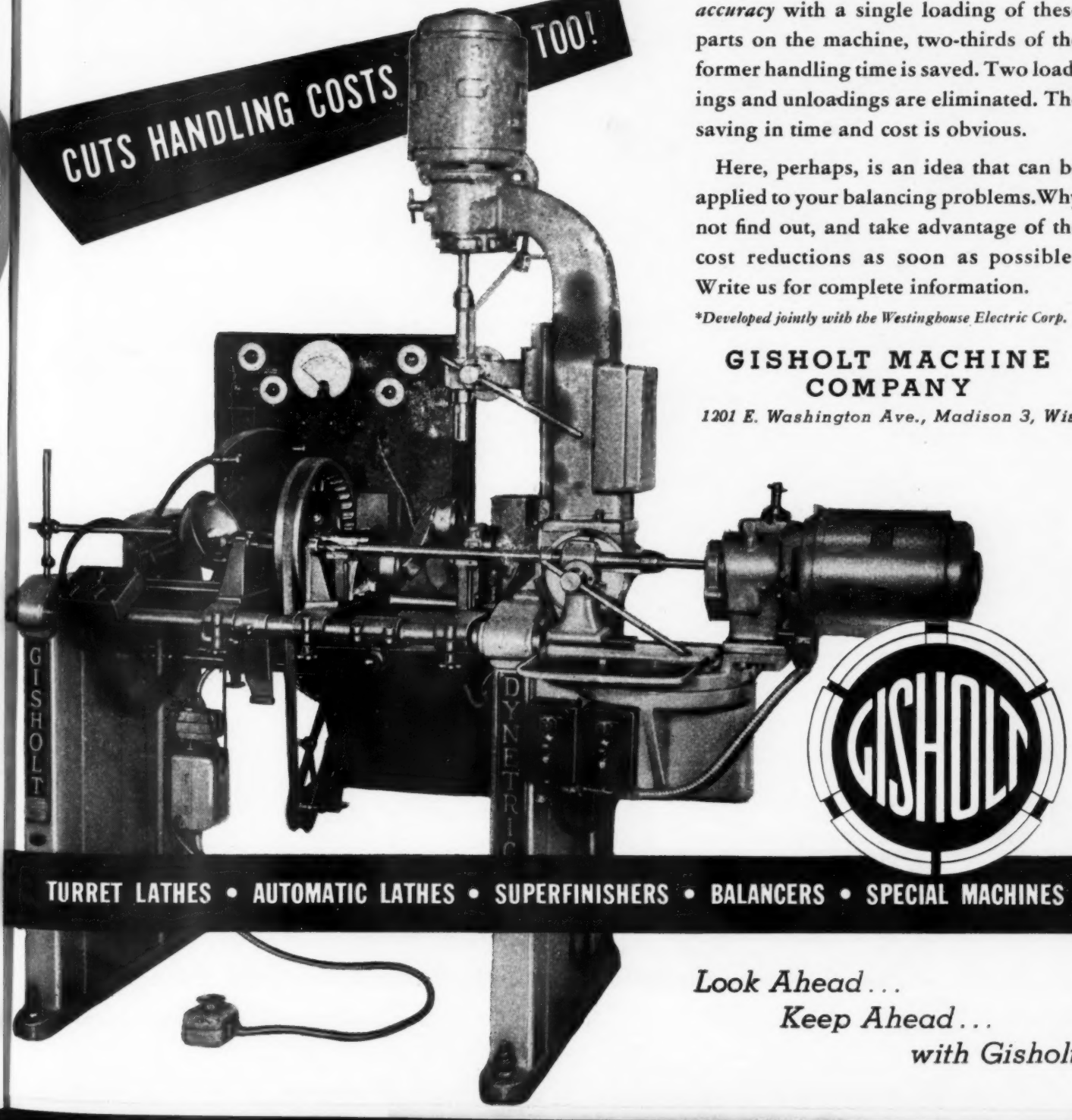
This Gisholt 3S Dynetric Machine is built complete with drilling equipment as an integral part of the machine, for making necessary corrections in both flywheel and crankshaft. The job illustrated, an assembly of two-throw crankshaft and flywheel, is heavy and awkward to handle. By making it possible to *measure* unbalance, to *correct* it, and to *check accuracy* with a single loading of these parts on the machine, two-thirds of the former handling time is saved. Two loadings and unloadings are eliminated. The saving in time and cost is obvious.

Here, perhaps, is an idea that can be applied to your balancing problems. Why not find out, and take advantage of the cost reductions as soon as possible? Write us for complete information.

**Developed jointly with the Westinghouse Electric Corp.*

GISHOLT MACHINE COMPANY

1201 E. Washington Ave., Madison 3, Wis.



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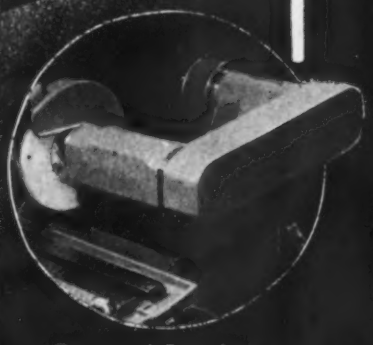
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Look Ahead . . .
Keep Ahead . . .
with Gisholt

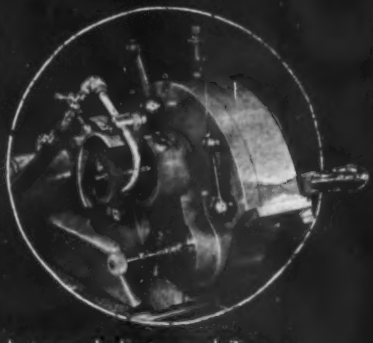
Designed for EFFICIENCY

TO PRODUCE MORE OF A GREATER VARIETY THRU EASE OF PRECISION SET UP AND OPERATION



External Bracket

The Rivett No. 104 is a simple, power-driven grinder suitable for tool making and precision manufacturing. Operations of widely varying nature can be quickly set-up and efficiently ground on one or many pieces. Interchangeable brackets are selectively mounted on the cross slide for internal, external, or concentric grinding in straight, taper, face or shoulder form.



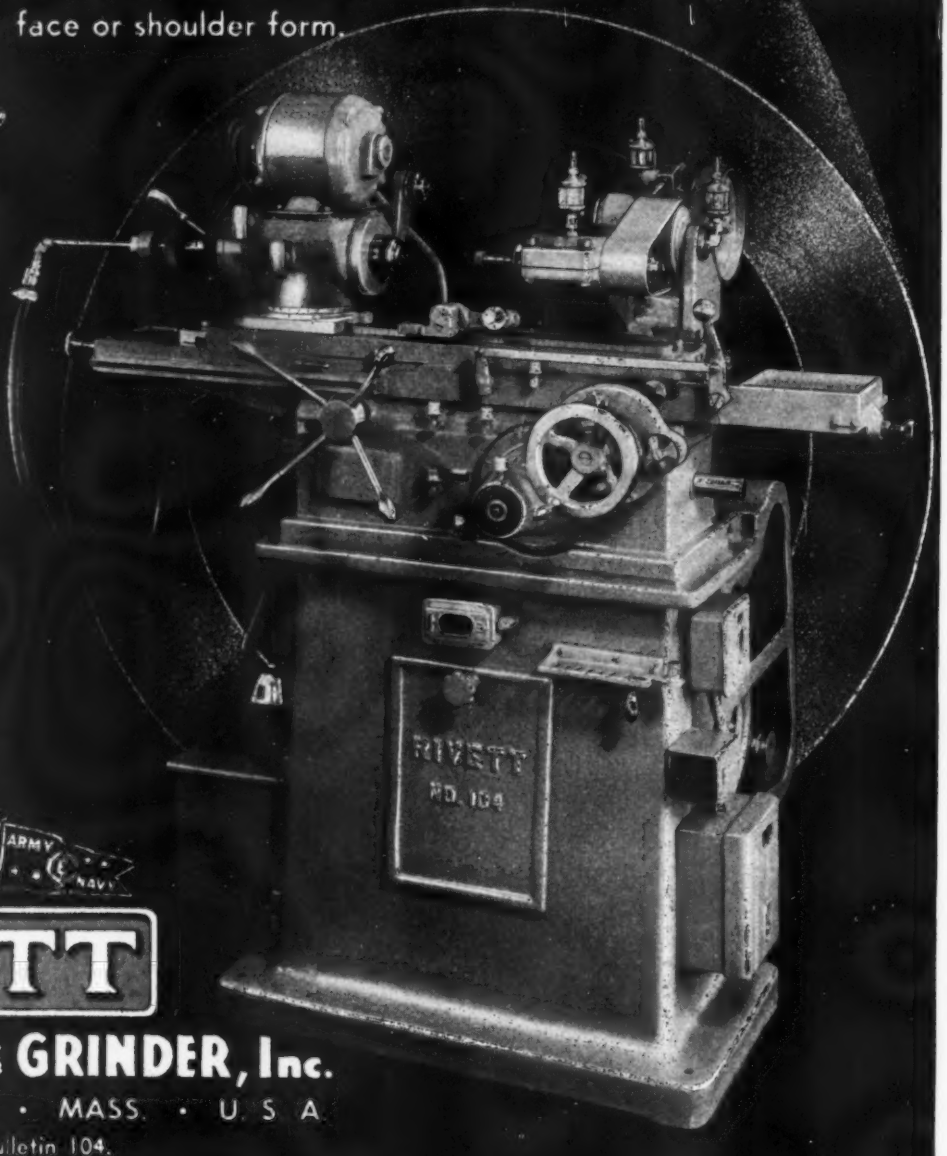
Internal, External Turret

RANGE

Internal spindles of suitable design and speed may be selected for hole grinding up to approximately 3" diameter and 4" length.

External bracket with 1" x ½" wheel may be used for on-center or chucked work up to approximately 3" diameter.

Turret for concentric grinding of hole or outside surface is limited to such work as may be chucked.



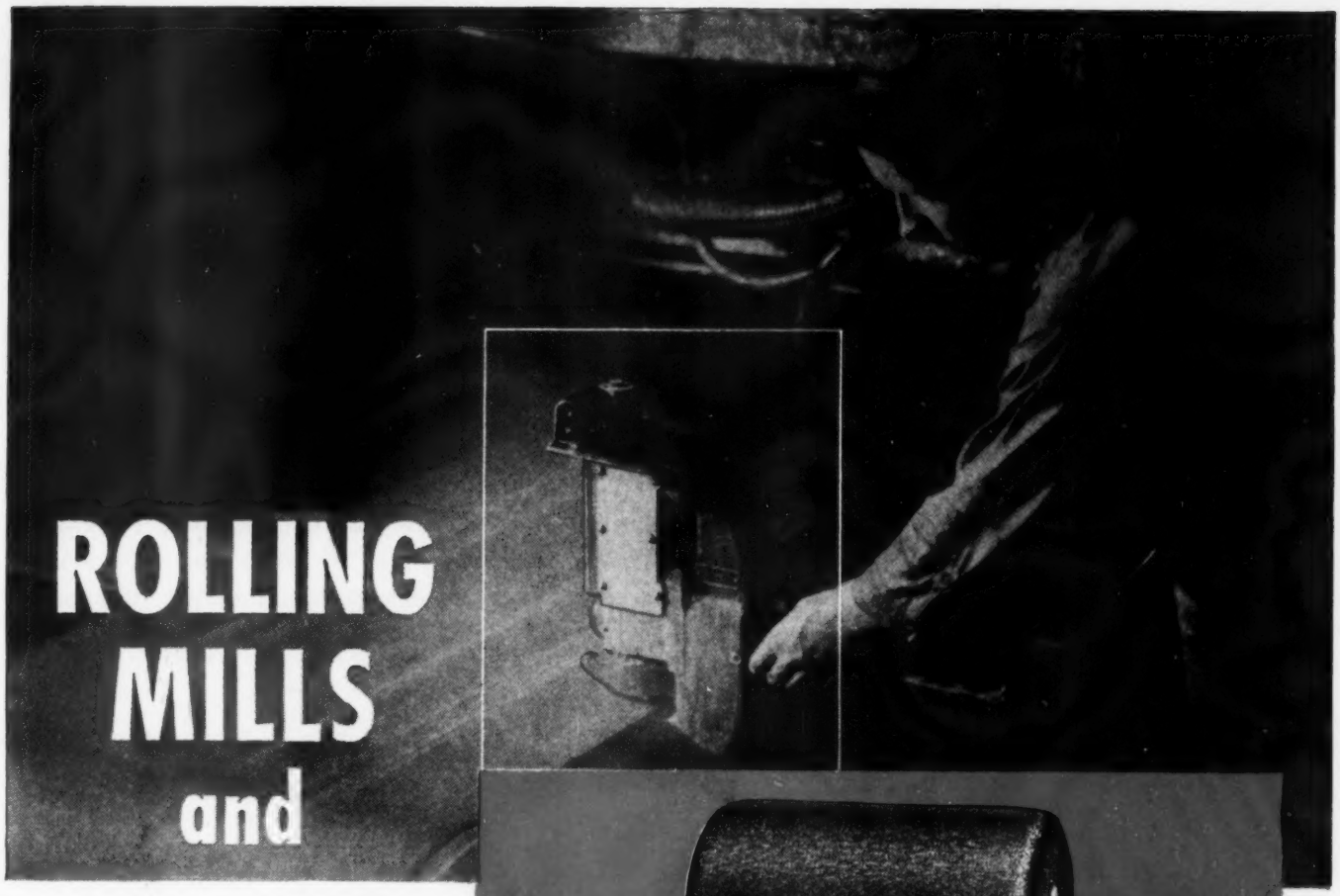
ARMY NAVY

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS. · U.S.A.

Write for Bulletin 104.



Hundreds of Other Products

Special Veeder-Root Counter used in Pratt & Whitney's Electrolimit Gage

. . . all can build more profits for their makers and users by built-in

VEEDER-ROOT COUNTROL

Variations in thickness of steel passing through the mill are given to the operator in a direct, decimal reading down to .0001" . . . by a Veeder-Root Counting Device mounted on the pulpit. That's *Countrol* . . . and that cuts waste, builds profit for the user of the mill . . . gives extra sales-power to the Pratt & Whitney Electrolimit Gage into which the counter is built as an integral part.

This is one of a limitless number of *special* Veeder-Root Devices developed for manufacturers of all types of products in all types of industry. Let Veeder-Root engineers show you what specialized *Countrol* can do to add new utility and sales-power to *your* product. Write to Veeder-Root Inc., Hartford 2, Conn. *In Canada:* Veeder-Root of Canada, Ltd., Montreal. *In England:* Veeder-Root Ltd. (new address on request).

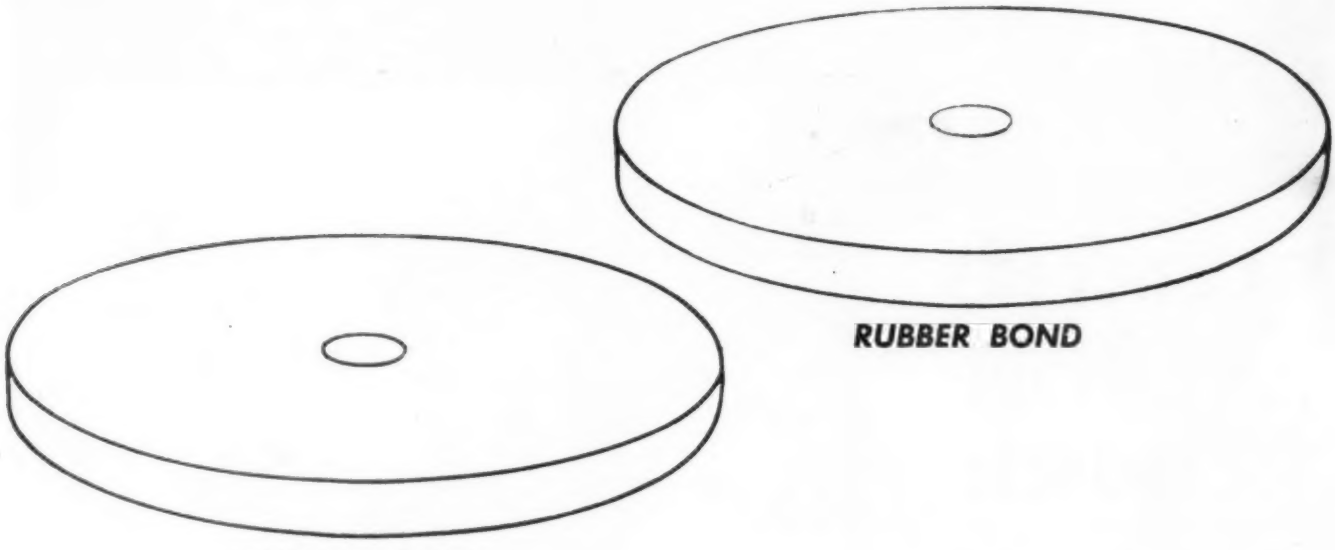
Give your product this extra Merchandising Feature

Who really knows

Your experience tells you this is a tough one to answer. You've seen what correct bond selection means in faster, better grinding at less cost. You know the importance of the right bond in terms of maximum cut with minimum pressure and lowest wheel loss.

You have probably seen one of your own shop experts worried with what seemed a logical choice. For, there's plenty of room for error in evaluating the many variable factors involved. For instance the speed of the grinder, tolerance limits, or production schedules are but a few of many factors to be considered. Yet, neglecting one...even partially...will upset the calculated performance of the wheel you choose.

To help you make the best choice of wheels, CARBORUNDUM has organized a system of checks and balances. It offers you a practical service...service easy to use...service depended on by many successful concerns.

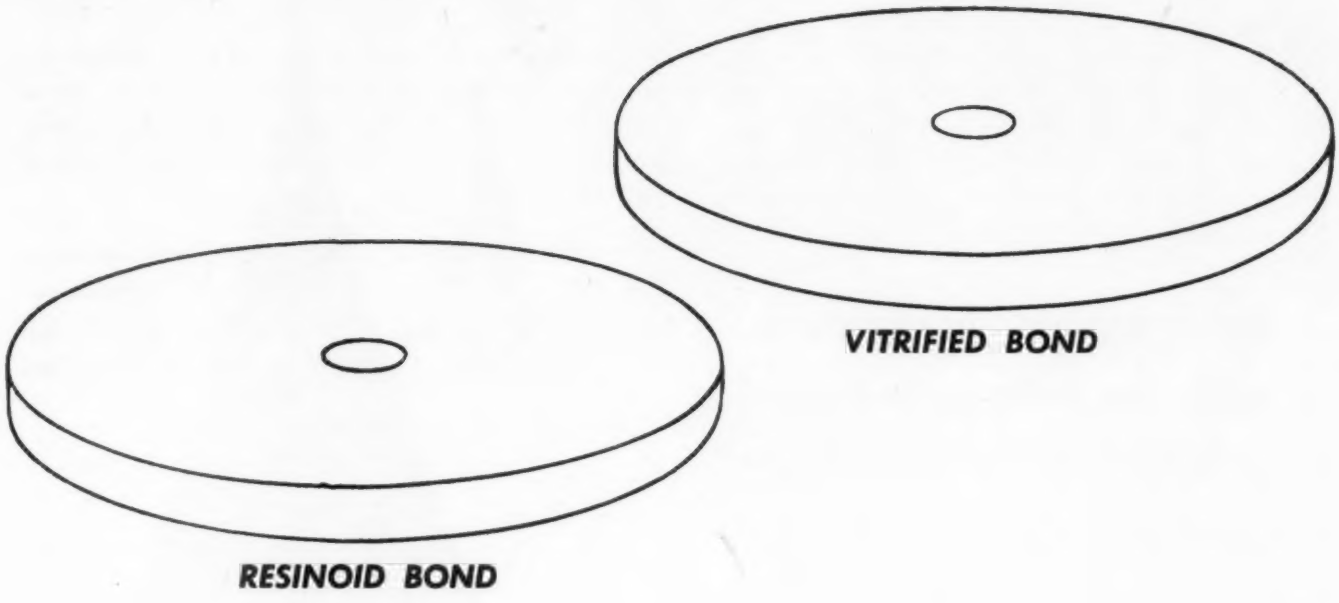


RUBBER BOND

SHELLAC BOND

A good rule for good grinding... **CALL**

what bond is best?



VITRIFIED BOND

RESINOID BOND

CARBORUNDUM salesmen and our distributor's representatives are your contact with this service. They are familiar with your needs. They are informed on latest abrasive developments. Supporting them in the field are our Abrasive Engineers... qualified to solve tough grinding problems. And here, in the modern laboratories of CARBORUNDUM, are scientists and technicians probing grinding practices in the light of abrasive development. As a result, they usually come up with the most direct solution to difficult grinding problems.

There is no better way to find out what bond is really best, or what wheel to use, than to depend on this organized service. It is a smooth working combination of knowledge and experience. Call in CARBORUNDUM. There is no surer means of making certain you are getting the best. The Carborundum Company, Niagara Falls, New York.

IN CARBORUNDUM

TRADE | MARK

BONDED ABRASIVES

WHEELS
- Silicon Carbide
- Aluminum Oxide
- Diamond

Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

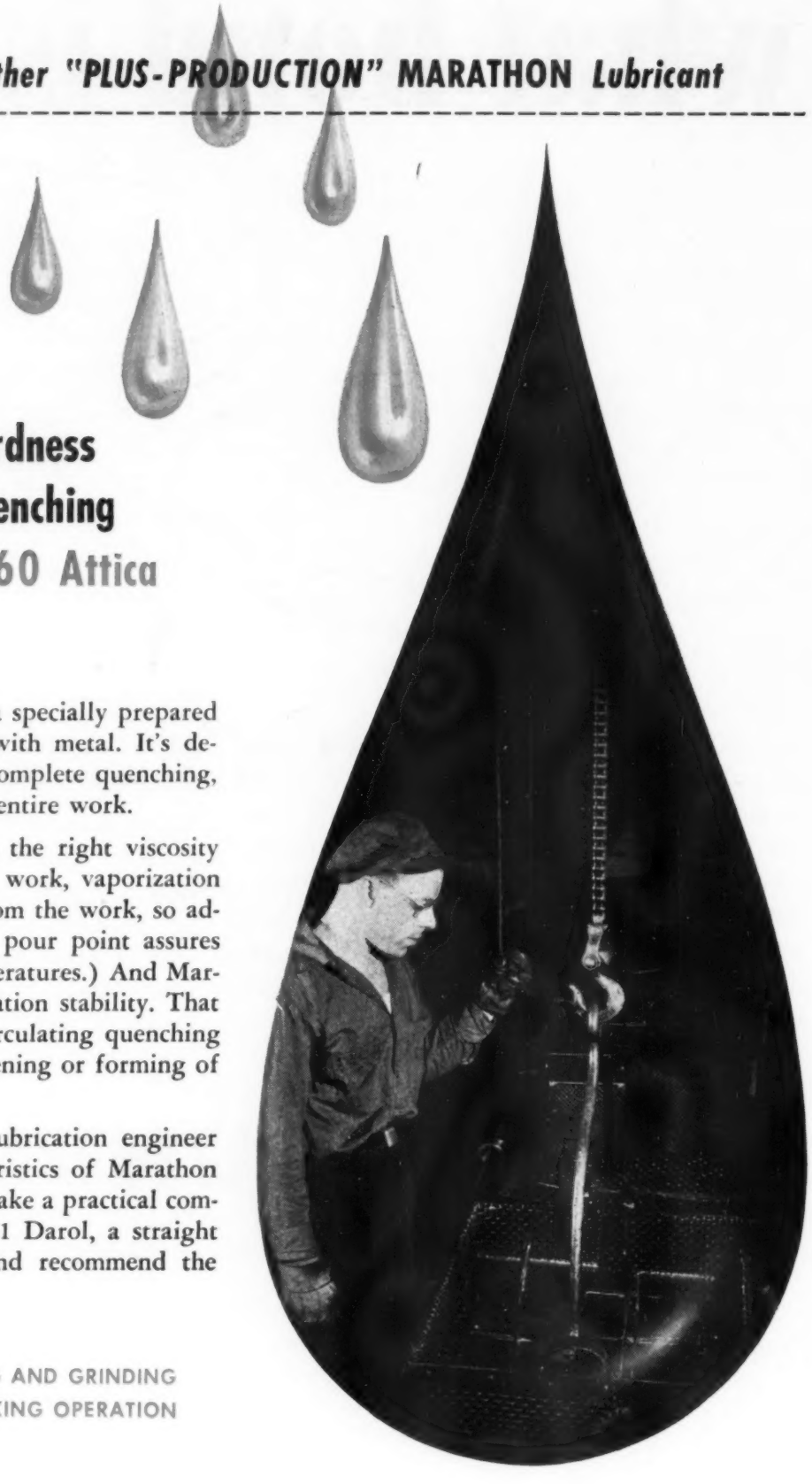
Paper, Cloth and Combination
Sheets, Rolls, Discs

ABRASIVE GRAINS AND COMPOUNDS

for:
Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

760 Attica . . . another "PLUS-PRODUCTION" MARATHON Lubricant



Get "spotless" hardness with the even quenching of MARATHON 760 Attica Quenching Oil

MARATHON 760 Attica is a specially prepared quenching oil that gets along with metal. It's designed for complete coverage, complete quenching, and uniform hardness over the entire work.

Economical, too. Though it's the right viscosity to conduct heat away from the work, vaporization loss is low. Oil drains freely from the work, so adherent loss, too, is low. (Low pour point assures ample fluidity even at low temperatures.) And Marathon 760 Attica has high oxidation stability. That means long service in vat or circulating quenching systems without sludging, thickening or forming of deposits.

Let an Ohio Oil Company lubrication engineer show you the superior characteristics of Marathon 760 Attica. He will be glad to make a practical comparison, too, with Marathon 461 Darol, a straight mineral high quenching oil, and recommend the best for your operations.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

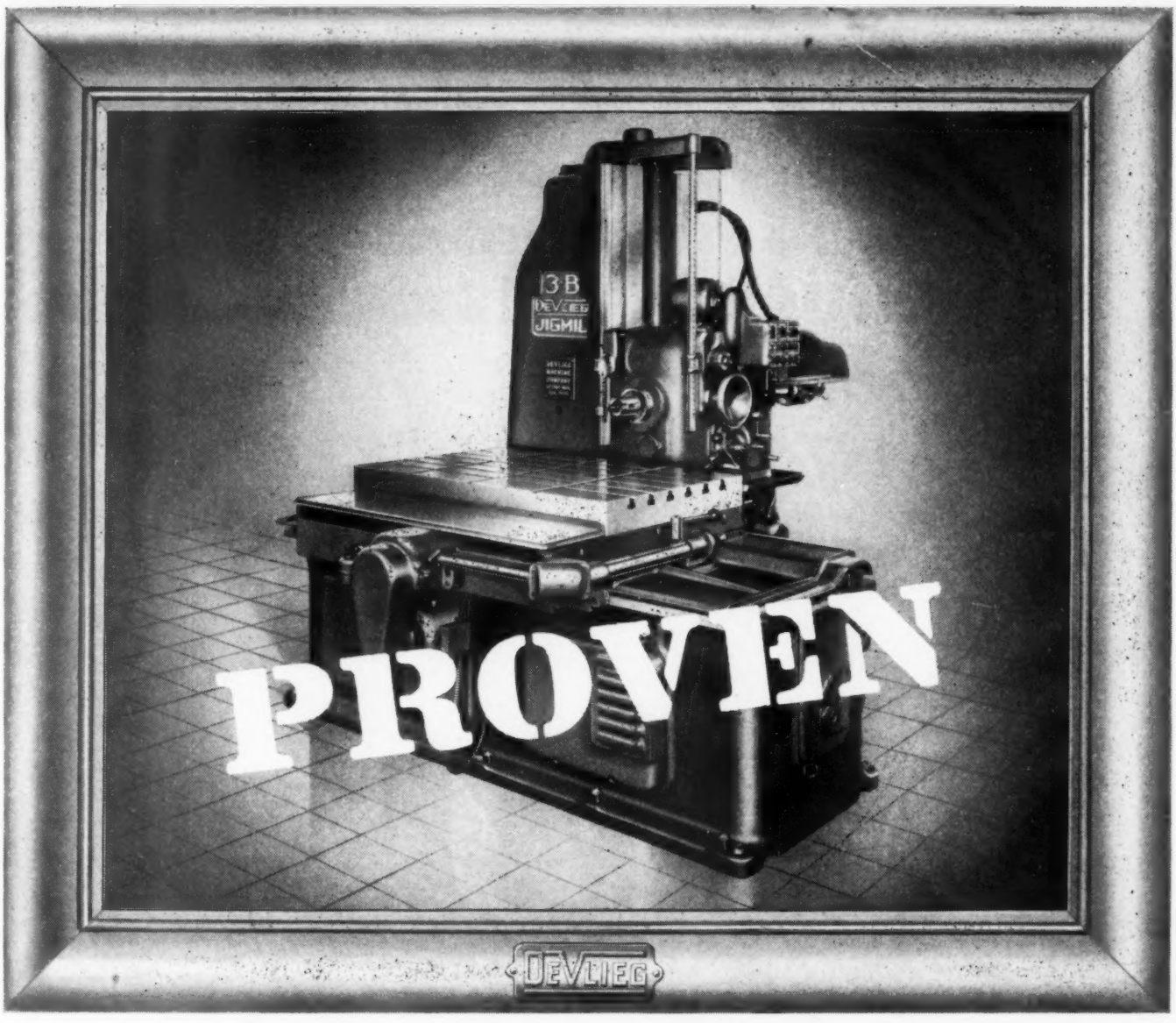
MARATHON

THE OHIO OIL COMPANY

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

PRODUCERS OF PETROLEUM SINCE 1887



The World's Finest Boring and Milling Machine

THIS new model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

After months of careful research and actual production tests, Lempco is now ready to offer you the best chucking reamer ever made. It is made in two styles. Model C has a straight shank. Model CT has a tapered shank.

The new Lempco Reamer can be used in place of any standard reamer without changing set up. They will produce a smooth finish even when used to finish holes with keyways, slots, oil grooves or other interruptions.

Lempco Chucking Reamers are available in sizes from ¾″ to 1 7/32″. They have an expansion range of .025″ to .031″ according to size. These reamers *are not deformed when expanded.* They have straight line expansion, thus assuring a constant cutting surface over the entire length of the blade at all times. Blades can be resharpened 8 to 10 times, then economically replaced.

Decide right now to buy Lempco Adjustable Chucking Reamers. They will enable you to get better and more accurate production.

WRITE TODAY FOR FULL DETAILS AND PRICES OF THE NEW LEMPCO CHUCKING REAMER

PHOTOGRAPH COURTESY GISHOLT MACHINE COMPANY, MADISON, WISCONSIN.

Magicians in Metal

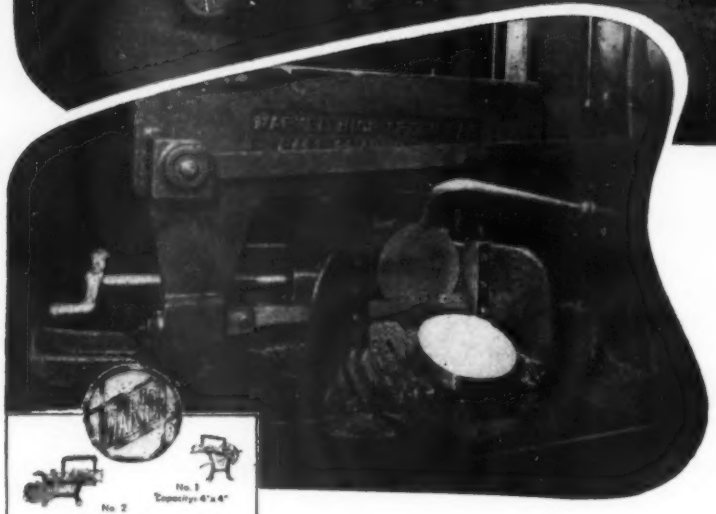
Timken Bearing Equipped spindles work magic in modern machine tools and the operator at the controls is the magician. At his will they produce precision; increase production; prevent waste.

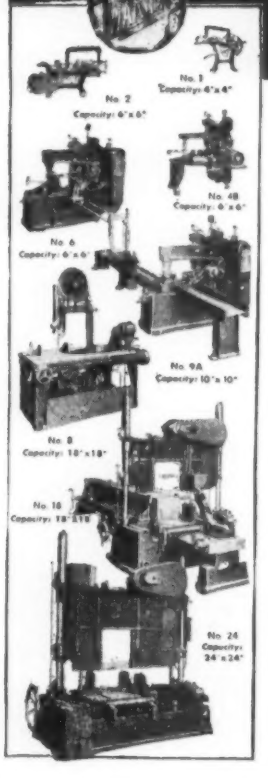
By their capacity to carry both radial and thrust loads and constantly maintain alignment, Timken Tapered Roller Bearings exercise complete and accurate control over the spindle under all speeds, feeds and cutting loads; save power; simplify lubrication.

There's no vibration, no chatter, no run-out; just smooth, steady rotation that's kind to tools and tempers.

Because Timkens are the world's best-known bearings, they make the world's best-selling machines. Look for the trade-mark "TIMKEN" on every bearing you use; none but the genuine have it. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS





No "waiting" cost here!

There are no costly delays, no men and machines standing idle, waiting for stock to be cut off from bars, when the stockroom is equipped with a No. 6A or 9A MARVEL High Speed Sawing Machine.

These *fast*, all-ball-bearing high speed saws will cut off accurate lengths or slices at almost unbelievable speed. Equipped with an automatic bar push up, they will cut identical pieces from single or nested bars automatically, with no more operator attention than an automatic screw machine. Still, at any point, the automatic operation can be interrupted, a miscellaneous cut made, and the "production" run resumed by simply re-engaging the bar feed. A single MARVEL Automatic can keep well ahead of a large machine shop, increasing the earning time on all machines.

There is a MARVEL Saw for every need—in every capacity range and price class. Your local MARVEL Sawing Engineer will gladly study your metal sawing problems and requirements and make recommendations as to methods and equipment.

Send for Catalog

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

***Eastern Sales Office:* 225 Lafayette St., New York 12, N. Y.**

MARVEL SAWS

Staples CARBOLOY-TIPPED CEMENTED CARBIDES SPOTFACERS AND COUNTERBORES

HOLD A KEEN CUTTING EDGE LONGER

Your economy begins, your quality improves, the moment a Staples Carboloy-tipped Tool starts revolving in the job.

Staples Spotfacers and Counterbores, with their diamond-ground Carboloy cutting edges, make easy work of cutting through highly abrasive casting scale. While ordinary tools are breaking down and killing valuable time, Staples Spotfacers and Counterbores remain keen and eager—produce the tolerances you seek, quicker—perform over and over at the peak of efficiency.

Staples engineers build superiority into Staples Tools by devoting their exceptional skills to a single objective—the making of circular cutting tools that serve longer and better. You are invited to investigate the cost-saving advantages in the Staples line . . . which includes Reamers, solid and expansion types; End Mills; Spotfacers and Counterbores. Standard tools available from stock; special tools designed to order. Write for complete catalog. *Distributors in Principal Cities.*

THE STAPLES TOOL COMPANY

Formerly Staples Tool & Engineering Company

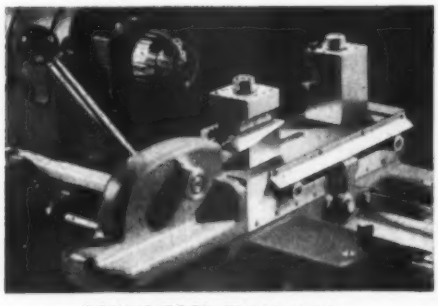
CINCINNATI 25 **OHIO**

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

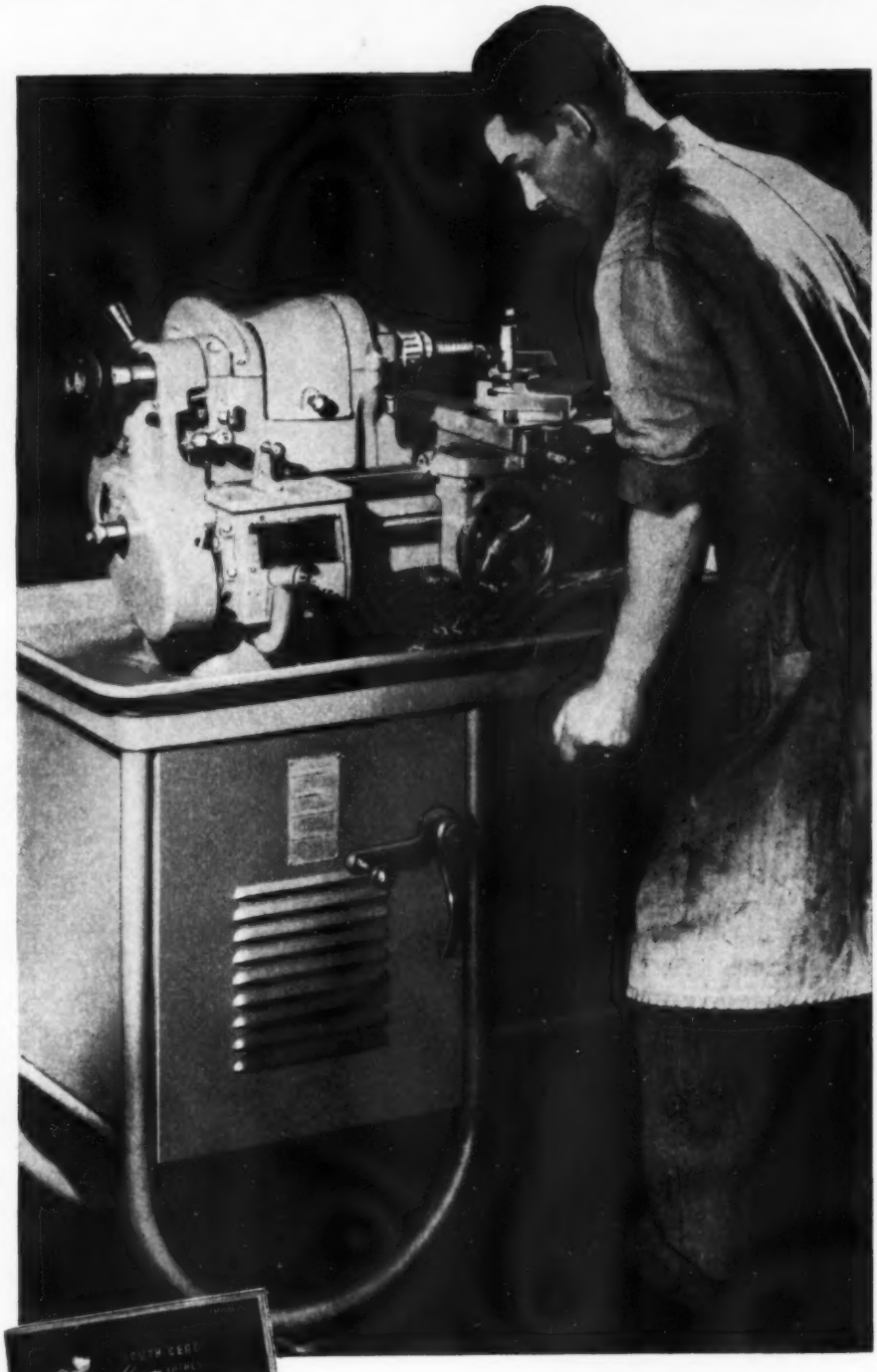
For Exacting
CLOSE-TOLERANCE MACHINE WORK

There is no substitute for precision accuracy either in the toolrooms or production plants of present-day industries. The smooth production of precision parts, trouble-free assembly, product quality and prestige, costs, and plant profits depend to a great extent on this one factor. That's why South Bend Precision Lathes, long famed for split-thousandth accuracy, are so widely used in the toolrooms, production shops, engineering and research laboratories, and in the maintenance departments of the nation's leading industries. If you are planning to install new lathe equipment, it will pay you to investigate the many advantages which versatile South Bend Lathes have to offer.



DOUBLE TOOL CROSS SLIDE

This Double Tool Cross Slide is only one item in the complete line of South Bend attachments and accessories which will help to broaden the scope of your lathes. Write for attachment Catalog 77.



ILLUSTRATED ABOVE:

10" x 3' South Bend Quick Change Gear Bench Lathe with Handwheel Collet Attachment. This model made with bed lengths to 4½'. Toolroom models made with beds to 4'.

WRITE FOR CATALOG

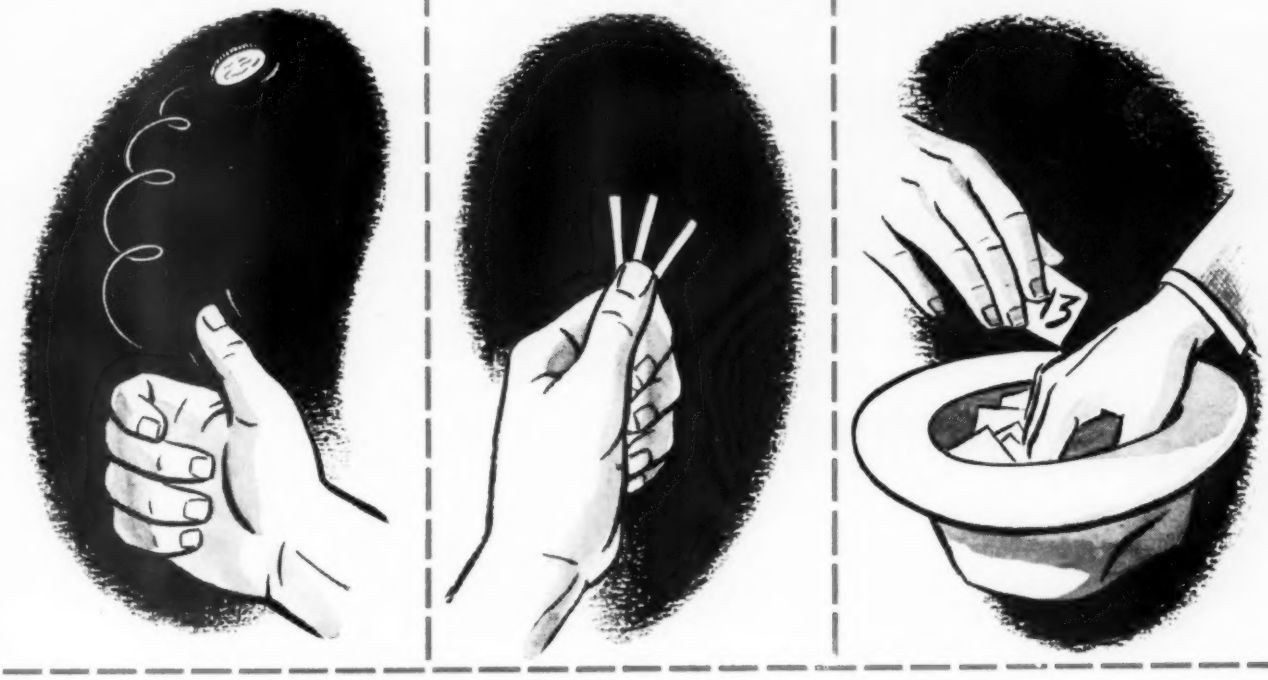
Write for Catalog 100-D which shows all types, sizes, and models of South Bend Toolroom, Engine, and Turret Lathes. Made with 9", 10", 13", 14-1/2", and 16" swings. State size lathe in which interested.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

THERE ARE MORE WAYS THAN ONE . . . .



. . . to select a cutting oil

TOSS A COIN . . . draw straws . . . pick a number from a hat . . . they're all ways you could use to select a cutting oil. Even though you haven't tried these methods you've probably felt at times that picking the right cutting oil was mostly a gamble.

That's why Standard Oil decided a number of years ago that supplying cost saving cutting oils was only part of its job. Trained specialists were also needed to help plant men apply these cutting oils to greatest advantage — specialists who knew the available cutting oils and the types of jobs for which they were best fitted.

This know-how is the essence of Standard Oil's Cutting Oil Service. If your plant is in the Midwest you can get this service simply by calling the nearest Standard Oil office or by writing 910 South Michigan Avenue, Chicago 80, Illinois. Then put your problem up to the Cutting Oil Specialist who calls.

Standard's
CUTTING OIL SERVICE

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

BRICATION ENGINEERING . . . STANDARD OIL COMPANY (INDIANA) . . . LUBRICATION ENGINEERING . . . STANDAR

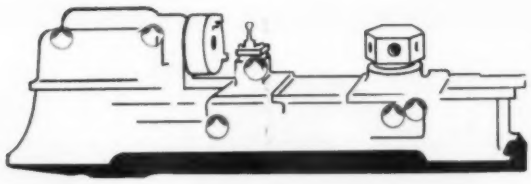
CODED LUBRICATION

tells your oilers 4 important facts... with simple numbers

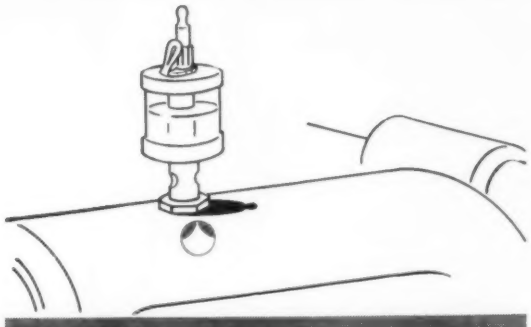
TROUBLED with getting the right lubricants in the right places? Standard's Coded Lubrication Service can help you. And it's easy to install and simple to follow.

Code numbers, not colors, are assigned to each lubricant used in your plant. Numbered decals are applied at each point to be lubricated, indicating which lubricant is to be applied. Every grease gun, oil can and storage container is numbered to indicate what lubricants are in them. Your oilers simply follow the numbers without having to remember brand names and grades.

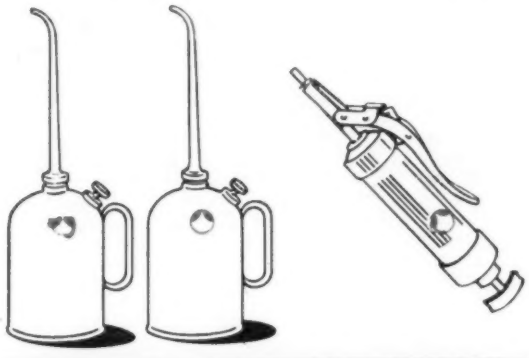
A Standard Oil Lubrication Engineer will be glad to discuss the application of Coded Lubrication in your plant. Call the nearest local Standard Oil office or write 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.



1. Where lubricant is needed



2. Which lubricant to use

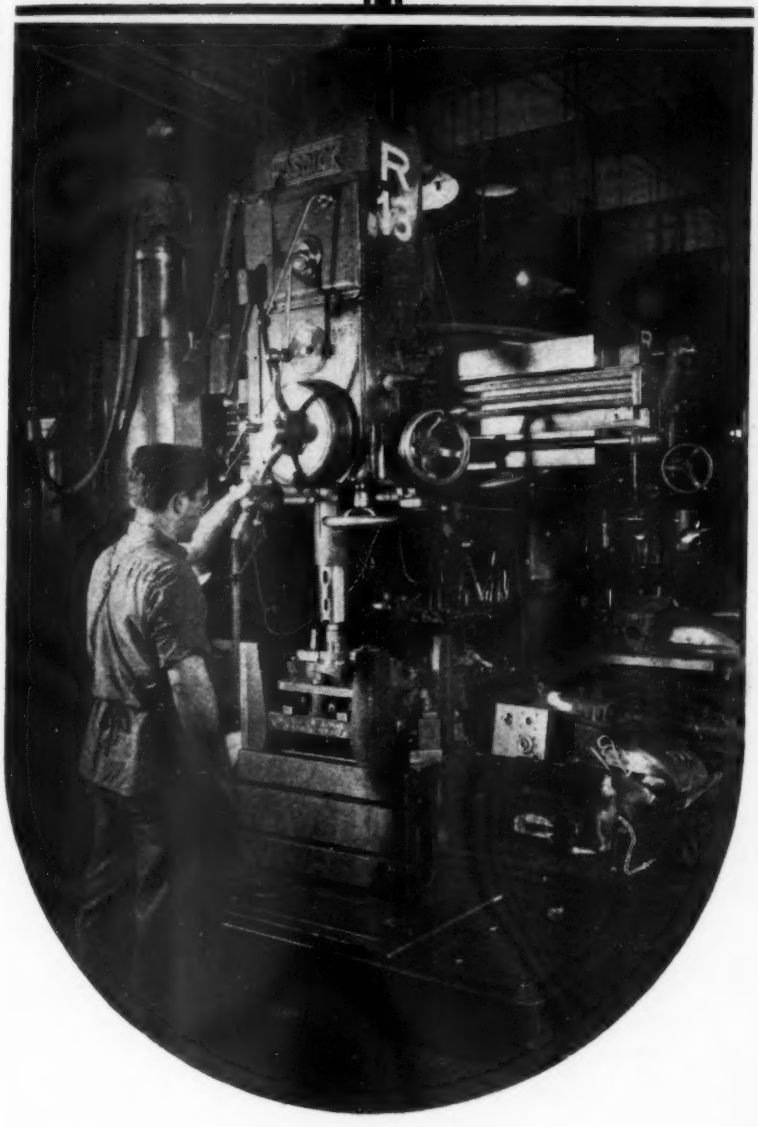


3. Which oil can or grease gun to use

4. Which lubricant is in each storage container

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE



BORING AND COUNTERBORING TO .0002" ON A FOSDICK RADIAL DRILL

● There are times when your job requirements call for particularly accurate production on work best suited to Radial Drill operation.

For example on the work shown four —2,834 inch holes are being bored and counterbored to limits of .0002 inch. At the same time there are several holes requiring drilling and reaming, others counterboring and a series of 1⅜ holes that must be tapped. All of these operations are accomplished on the Fosdick Hydraulic Radial shown and strict tolerances are maintained.

This is a typical Radial Drill job and the use of the jig insures continued accuracy and a high rate of production.

The rigid construction throughout—the centralization of all controls on the head—the ease of operation are points that account for the low cost production obtained from this modern radial.

When you have job requirements that call for a radial investigate the many advantages of the Fosdick Hydraulic. Complete details of construction and many points on economies of operation are contained in the Fosdick Radial Bulletin R. A.—*Write for yours.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

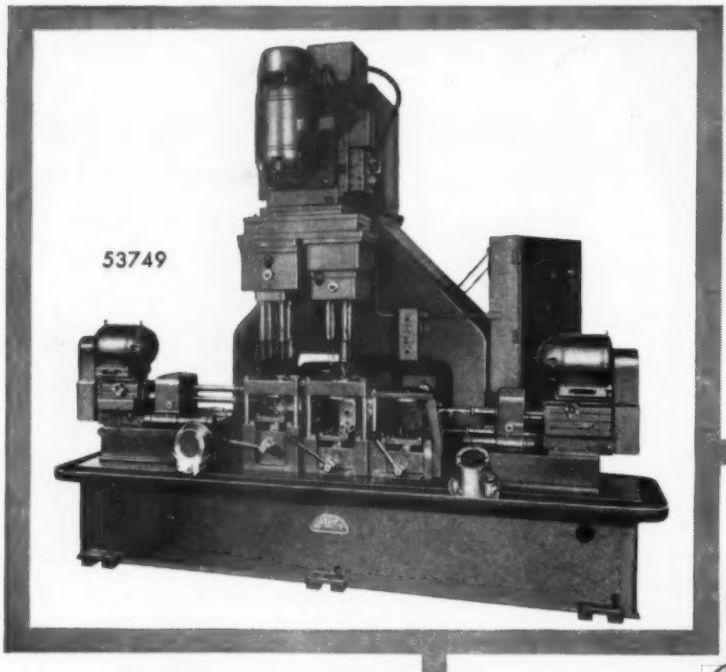
SNYDER 4-WAY SPECIAL DRILLING AND TAPPING MACHINES FOR PROCESSING PUMP HOUSINGS

Objective of the companion special drilling and tapping machines shown below is the rapid and economical processing of pump case parts used by one of the country's leading pump manufacturers. Without sacrifice of special-machine efficiency, the two 4-Way Snyders incorporate provision for alterations and changes in work piece design. Each machine processes simultaneously work pieces of dissimilar size and shape.

Three quick-clamping fixtures on each machine accurately position work for drilling and tapping action from seven separate multiple heads. The first fixture accommodates one housing, while the second and third fixtures each clamp a second housing in a different position. Multiple heads are driven from standard self-contained hydraulic power units and are operated in a cycle by push-button control.

Substantial economies are expected as a result of simplified and unified design of all machine elements. Mounting of power units and fixtures on the common horizontal plane of the machine table permits easy adaptation to product changes, and restricts the corresponding machine changes to the multiple head and fixture immediately concerned. Multiple heads are designed in individual spindle groups in order to accommodate changes in the design of work parts. Both machines are excellent examples of the versatility and efficiency characteristic of well-engineered specials.

In numerous applications such as these, specials offer advantages beyond the scope of standard machines. The special, for example, brings fast automatic operation, simplified handling, and lowered operator fatigue as a solution to the current problem of diminishing worker productivity. Also, in your shop, as in many others, the higher production rates, superior control of accuracy, finish and time cycle possible with special machines may be of critical importance. Check this possibility with us. *Snyder Tool and Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*



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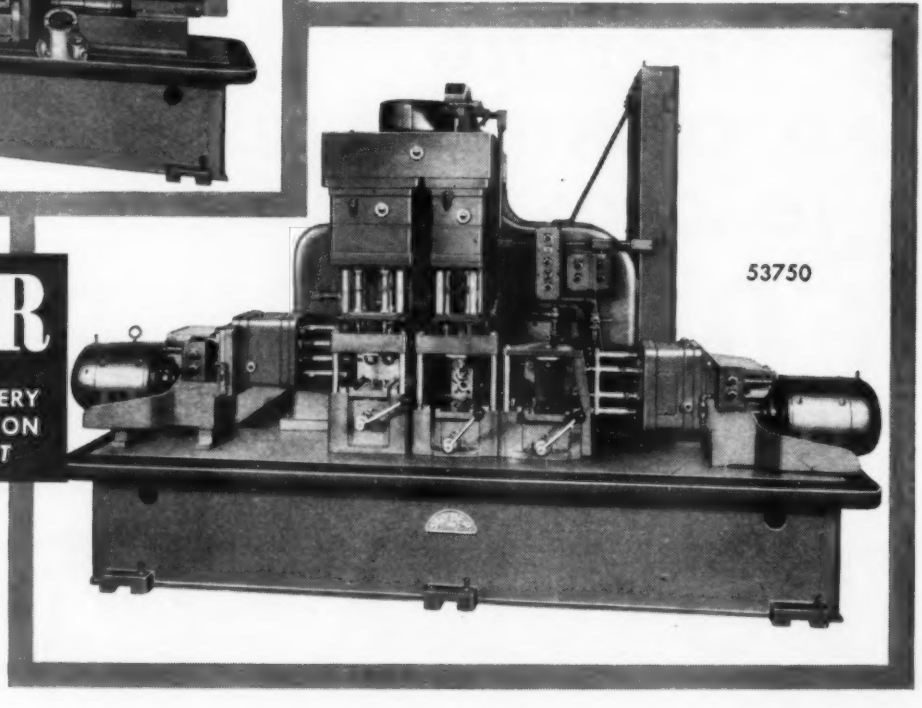


53750

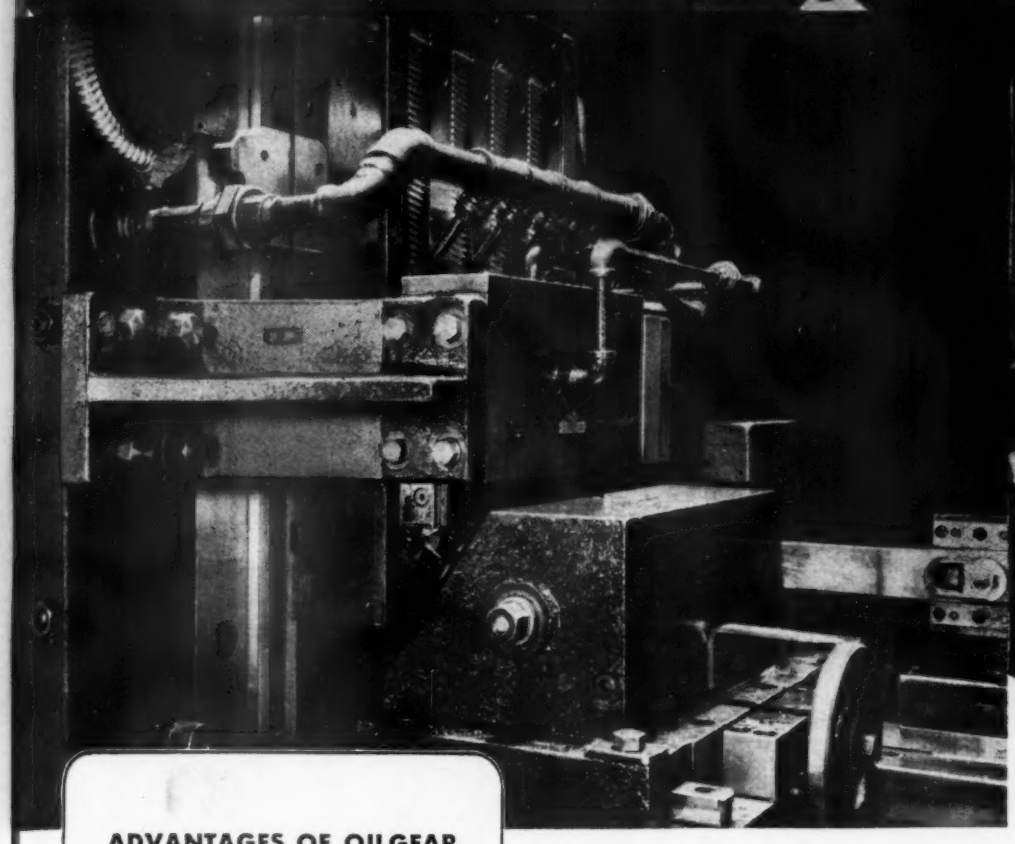
SNYDER

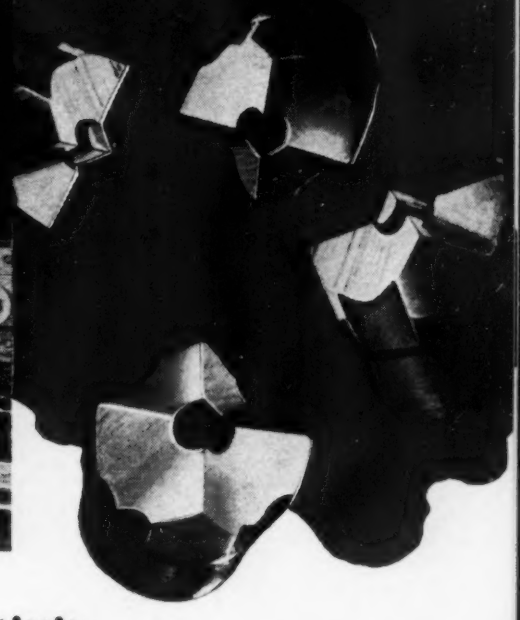
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

21 Years of Successful Cooperation with Leading American Industries

MORE GOLD...

with Oilgear Fluid Power Broaching





ADVANTAGES OF OILGEAR BROACHING MACHINES

High broaching speeds, higher return speeds. Infinitely adjustable cutting and return speeds. More efficient use of electric power permitting smaller motors. More efficient use of the fluid medium, allowing oil reservoirs as little as 1/5th the size of others; more compact and usable machines. Wide and roomy tool slides and shuttle tables, manual, semi-automatic and full-automatic cycle control at no extra cost. Positive control interlock with fixture operation.

OILGEAR

In 1938, an Oilgear Surface Broaching Machine was sent up into the wilds of Canada, hundreds of miles from anywhere. It was to try its hand at sharpening rock drill bits used in Hollinger Consolidated Gold Mines Ltd. operations as against both hot milling and conventional steel sharpening.

Here is what happened: to date, this single machine has sharpened more than 4 million 551 thousand bits. It sharpens 175 bits per hour as against 70 by the hot milling method. With two men for the broaching and turning operations, it equals the output of three of the conventional steel sharpening machines with six men. Oilgear Broaching takes off less metal, yet gives sharper, cleaner edges, more efficient drilling. It averages 25,000 drill bits per tool regrind. Aside from a minor pump adjustment on March 18, 1939, it has required no maintenance whatsoever.

"(The) performance (of this Oilgear Broach) has been the main factor in our choice of another Oilgear machine for future operations," writes Mr. F. Wolnod of the Hollinger Company.

The gold you dig for may not come from mines. But you will get *more* "gold" if you turn to Oilgear Fluid Power Broaching. THE OILGEAR COMPANY, 1313 W. Bruce Street, Milwaukee 4, Wisconsin.

Oilgear manufactures a complete line of broaching machines . . . horizontal and vertical for every internal and external broaching operation.

Oilgear Fluid Power

"Put it on the Blanchard"

These are cast iron gear case housings being ground on a No. 18 Blanchard Surface Grinder—another demonstration of increased production of large work over former method.

They are held on a 42" magnetic chuck, three pieces per load, and 1/8" to 3/16" of stock is removed from the surface.

Production is at the rate of 8 to 9 per hour, a substantial increase over the former method of machining when only 2 were produced per hour.

When flat surfaces are required to provide oil-tight joints, "put it on the Blanchard" and also get increased production.

Get These Advantages...

PRODUCTION ✓
ADAPTABILITY ✓
FIXTURE SAVING
OPERATION SAVING
MATERIAL SAVING
CLOSE LIMITS
FINE FINISH
FLATNESS ✓

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

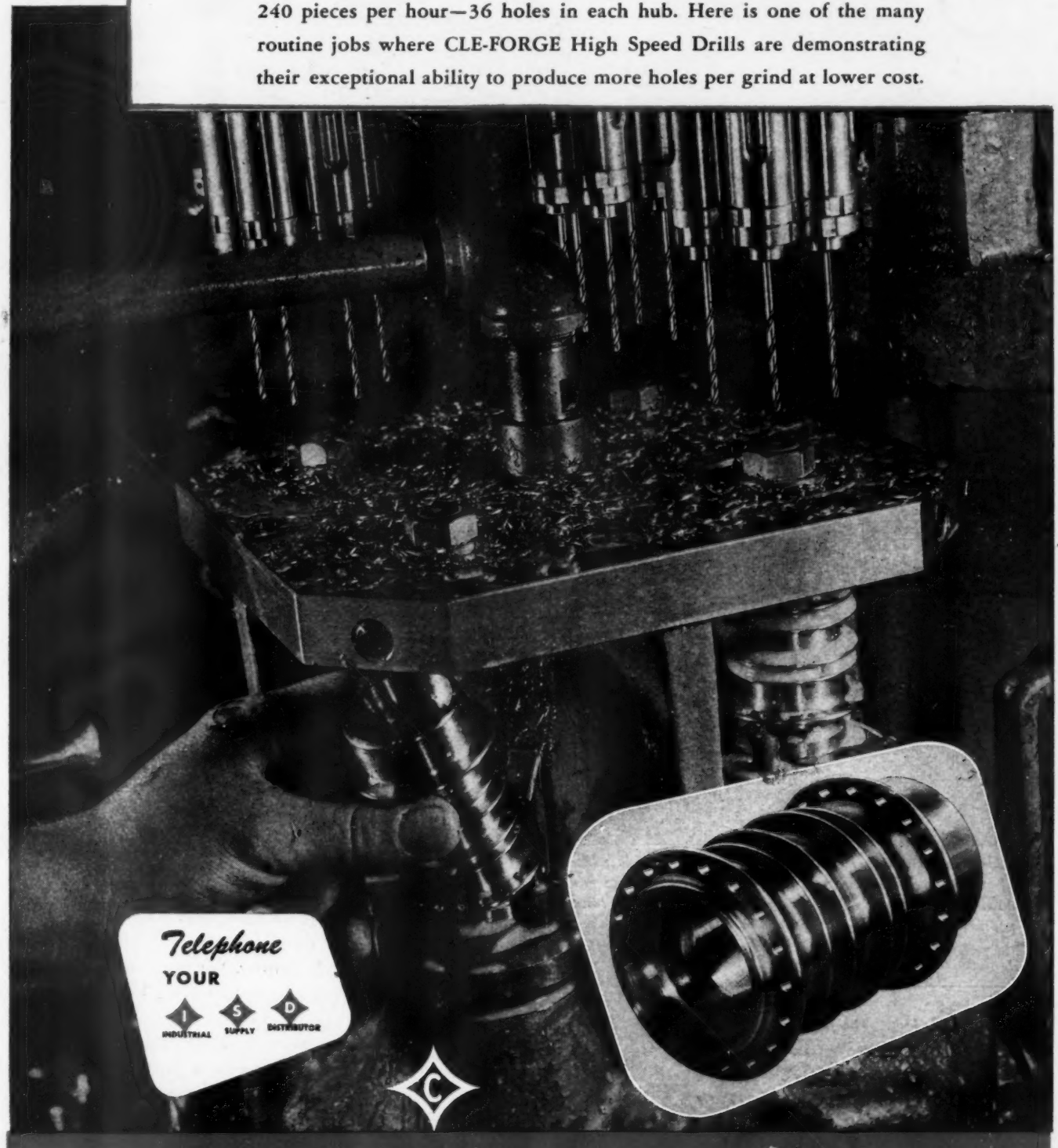
The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

8,640 holes per hour with CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.

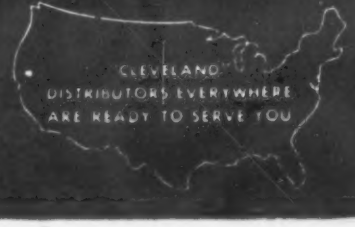
The production schedule on these coaster brake hubs calls for 240 pieces per hour—36 holes in each hub. Here is one of the many routine jobs where CLE-FORGE High Speed Drills are demonstrating their exceptional ability to produce more holes per grind at lower cost.



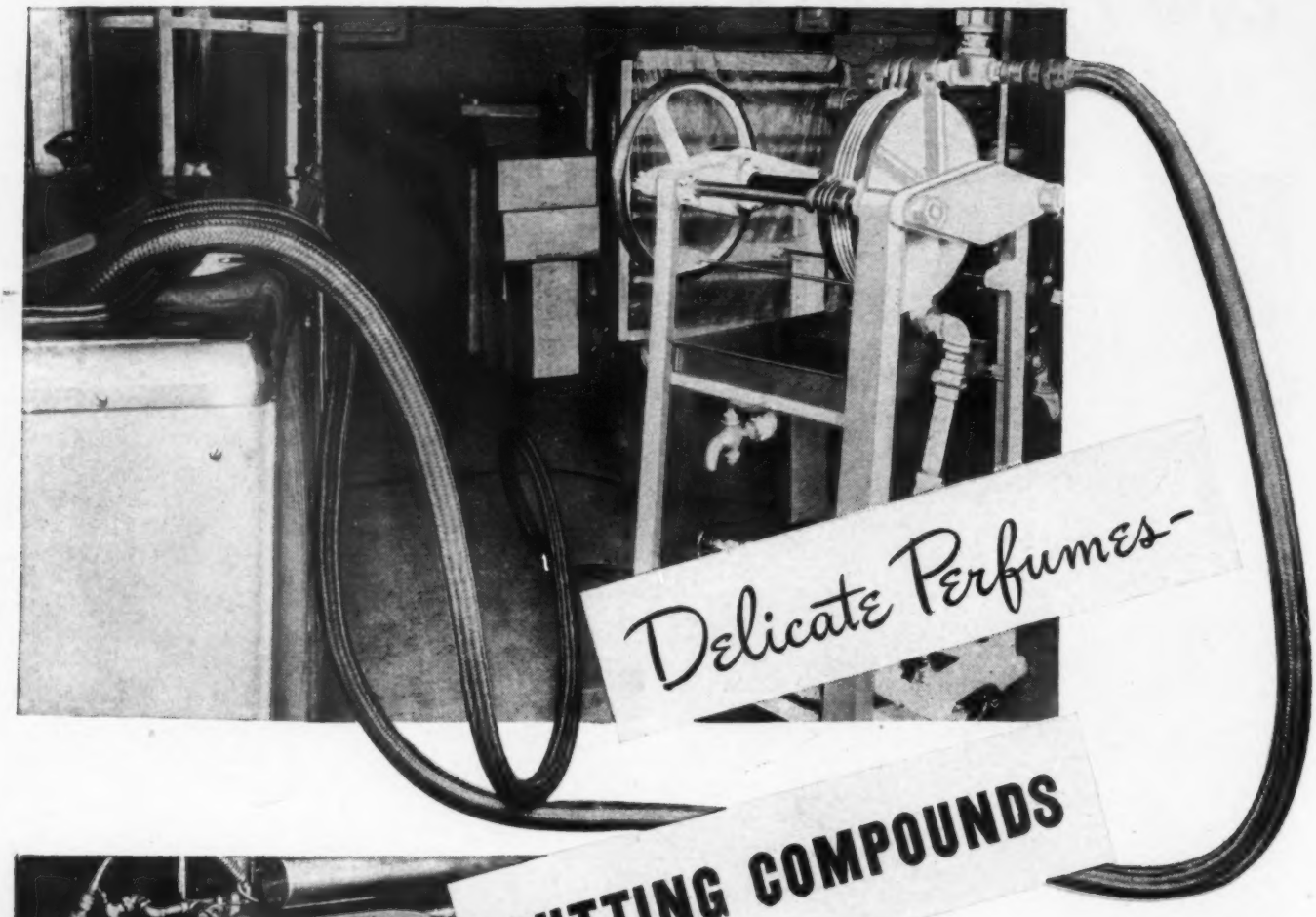
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

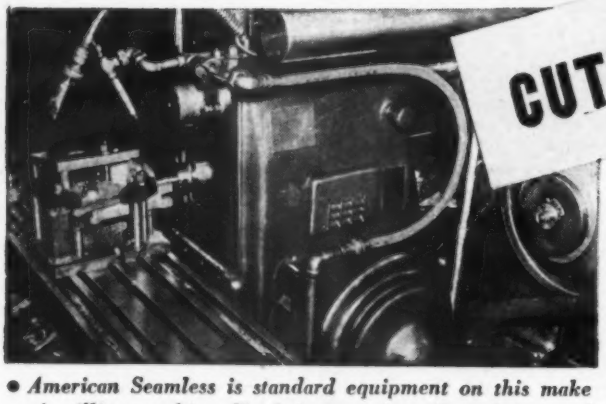
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 609 HOWARD ST., SAN FRANCISCO 5
7929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W. 3, ENGLAND



• *The readily-maintained cleanliness of American Seamless assures this user complete freedom from impurities that might contaminate delicate perfume being carried between storage tank and filter.*





• *American Seamless is standard equipment on this make of milling machine. Used for carrying oils, solvents and cutting compounds, its sturdy toughness assures long, economical service.*

BOTH conveyed through *Flexible* Connections

THESE ILLUSTRATIONS show but two of thousands of various applications of American Flexible Metal Hose and Seamless Flexible Tubing. For these durable products are continually being adapted to new and "different" engineering needs.

Steam, oil, water, gases, refrigerants and other fluids ... at high or low pressures and temperatures ... are safely and economically handled by American assemblies.

Whether *your* problem is one of compensating for vibration, connecting moving parts, or providing for misalignment, American has ... or can quickly develop ... a flexible assembly to do the job.

For detailed information on American Flexible Metal Hose and Seamless Tubing, write for Publication SS-50.

46349

ANACONDA

American
METAL HOSE

THE AMERICAN BRASS COMPANY
American Metal Hose Branch
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD.,
New Toronto, Ont.

A Dependable Working Partner

BETTS 100″ BORING AND TURNING MILL

For full details send for Bulletin No. 2128

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

BETTS BORING AND TURNING MILLS are built from 100″ up to any requirement

As in all Betts machines, the accumulated experience of more than three-quarters of a century is built into this general purpose boring mill . . . another striking example of Consolidated's ability to combine accuracy and power with maximum productiveness.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Banish "Speed Limits" PRODUCTION

PROJECTION WELDERS

SEAM WELDERS

SPOT WELDERS

GUN WELDERS

ROLL SPOT WELDERS

AT THE
Metal Congress Show
Atlantic City • November 18-22
Exhibit No. F-125 Main Floor
See Federal Automatic Welders teamed with Warco presses and other interesting demonstrations.

THIS BOOK ANALYZING BASIC TYPES OF FEDERAL AUTOMATIC WELDERS AND THEIR APPLICATION IS YOURS ON REQUEST

THE Federal MACHINE

SUBSIDIARIES
Sommer and Adams Co., Cleveland—SPECIAL HIGH PRECISION MACHINES
The Warren City Mfg. Co., Warren—WARCO PRESSES and PRESS BRAKES

From The Road to —use Federal Resistance Welders

FOR SPECIAL DELIVERY
Current production permits early shipments on these models
PA 1 Press Type Welders
Rocker Arm Spot Welders
Subject to prior order

Many of the limitations imposed on production speed in the metal working industries are avoidable.

The fact is that material shortages and unit-man-hour problems beyond our control make it more imperative than ever to do away with limitations that are more or less self-imposed. Specifically, failure to employ methods of maximum efficiency.

Automatic welding has made possible more short cuts in time and cost in metal goods manufacture than any one method or "tool" we know. Wherever metal to metal fastening on a production basis is a problem, there's a strong chance of resistance welders of one type or another providing the most efficient answer. Federal makes every type and size of resistance welder, many specially designed for highly special needs.

Motive behind the great National Metal Congress show at Atlantic City is to provide a refresher course on the most modern and efficient methods for speeding production. Federal will be there with a big demonstration pertinent to this point. (Exhibit F 125, Main Floor) . . . A wonderful chance for you to get authoritative advice on methods banishing speed limitations.

Meantime there's a Federal representative in every key city ready to give you such advice immediately. There's also bulletin SP 346 (illustrated herewith) which describes the vast variety of basic types of Federal Resistance Welders and their application. *Get your copy now!*

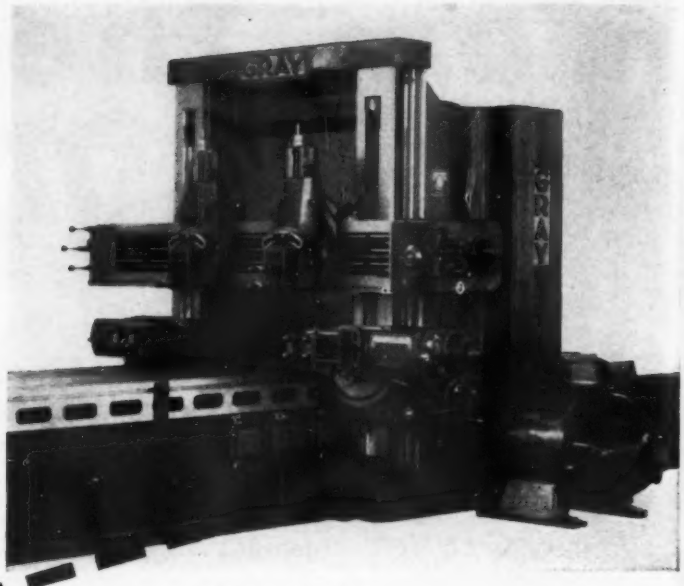
AND WELDER COMPANY

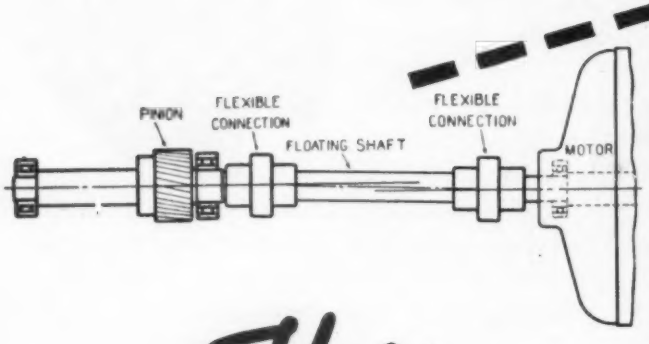
MEMBER RESISTANCE WELDER MANUFACTURERS ASSOCIATION RWMA

230 DANA STREET • WARREN, OHIO

GRAY FLOATING SHAFT DRIVE

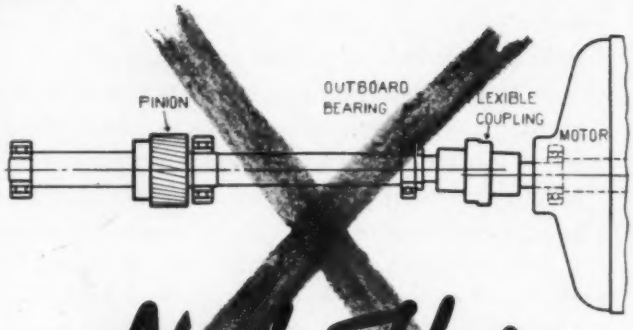
(Patent Pending)





This

The Gray floating shaft has been designed with flexible connections in place of the usual flexible coupling (see drawings). This system relieves the bearings of the strain caused when the motor, under the stress of heavy operation, gets out of line with the planer shaft. Note that bearing A on the right hand drawing is eliminated.



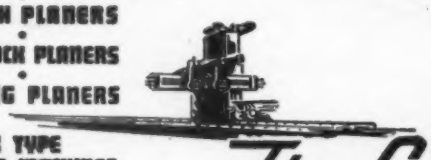
Not This

Note the strain (flexible coupling) imposed on bearings when shafts are not in alignment. This strain results in wear, vibration, noise and backlash, all of which contribute to inefficiency of operation.

The above comparisons illustrate the advantage of the Gray floating shaft drive over the old type of conventional flexible coupling. You will note that the motor drives the gear train through a floating shaft, thus eliminating strain and wear on the bearings as well as the multitude of coupling troubles that are bound to result from misalignment of motor and planer drive shafts. It obviously also eliminates vibration due to misalignment of motor.

DOUBLE HOUSING and OPEN SIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS

PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

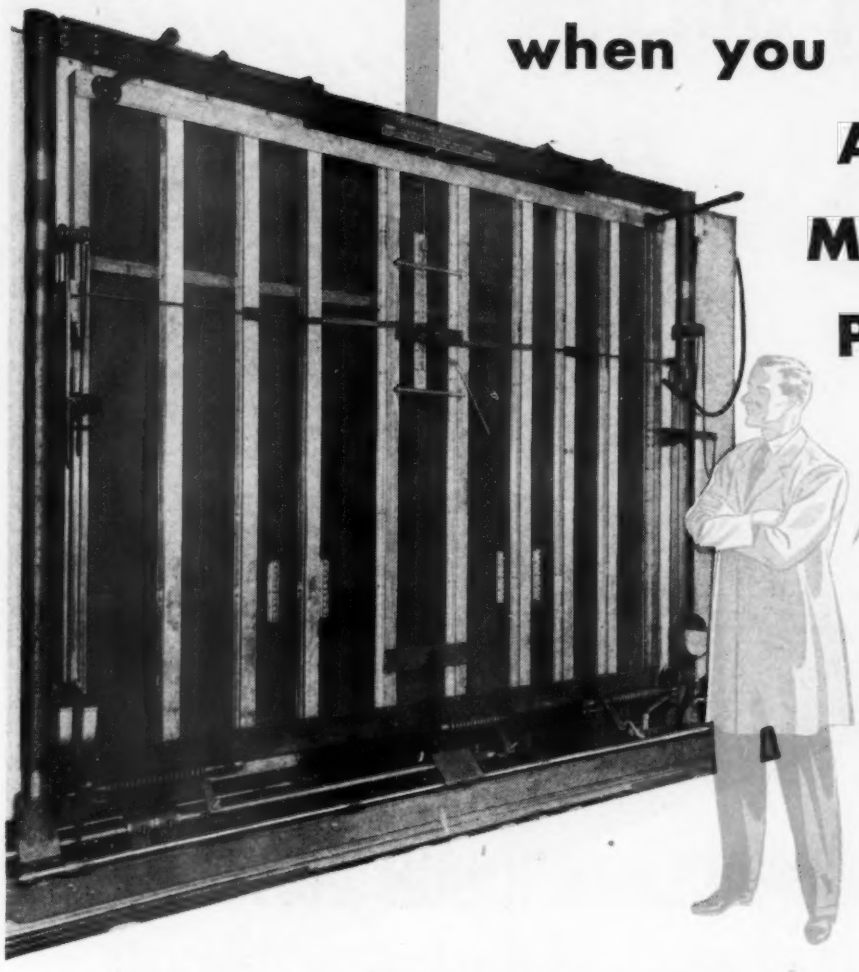


Sold in Canada by Upton, Bradeen and James, Ltd. Sold in Latin America by Machine Affiliates.

The G.A. **GRAY** *Co.*

CINCINNATI 7, OHIO, U. S. A.

You can think BIG when you work with AMERICAN MAGNESIUM PRODUCTS



Backboard of a Rutherford Photo-composing Machine using American Magnesium extrusions to save weight. The board is rigid; no warping to cause distortion.

Has BIGness been a stumbling block because it involves excessive weight and unwieldiness? You can make an about-face in your thinking, if you start with featherweight American Magnesium products. Look at this equipment, for example—

It's eight feet high. Yet work goes fast, movements are precise, and one man handles it easily, thanks to the smart design and wide use of weight-saving Mazlo Magnesium.

American Magnesium Corporation makes a complete line of products to help you cut excess weight. Sand castings, permanent mold and die castings, shapes, sheet, and plate; all are available to the manufacturer whose development work has been stymied by the idea that size means overweight and too much bulk.

For help in designing magnesium into your products, call the nearby Alcoa office. Or write Aluminum Company of America, Sales Agent for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

REG. U.S. PAT. OFF.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF

ALUMINUM COMPANY OF AMERICA

NEW AND IMPROVED
DU PONT SOLVENT
for VAPOR DEGREASING!

AVAILABLE NATIONALLY THROUGH DISTRIBUTORS!

Under various trade names, Du Pont Trichlorethylene and Perchlorethylene solvents for metal cleaning have served American industry successfully for many years. If you have used vapor degreasing solvents in your plant, no doubt you have used these solvents made by Du Pont.

NOW Du Pont has developed *new and improved* Trichlorethylene and Perchlorethylene—the same fine solvents, but BETTER THAN EVER, thanks to various technical improvements. These are the best Vapor Degreasing solvents we've ever made—the best we know how to make. Use them with complete confidence and assurance for all metal degreasing work. We believe they'll serve you *better!*

NEXT TIME you specify solvents for Vapor Degreasing, specify *new and improved* Du Pont Trichlorethylene and Perchlorethylene—available nationally through distributors as "Triclene" D and "Perclene" and under other trade names. Look to these solvents for superior work, maximum savings! Send today for your copy of our new free book, "Metal Degreasing—Standard Practices."

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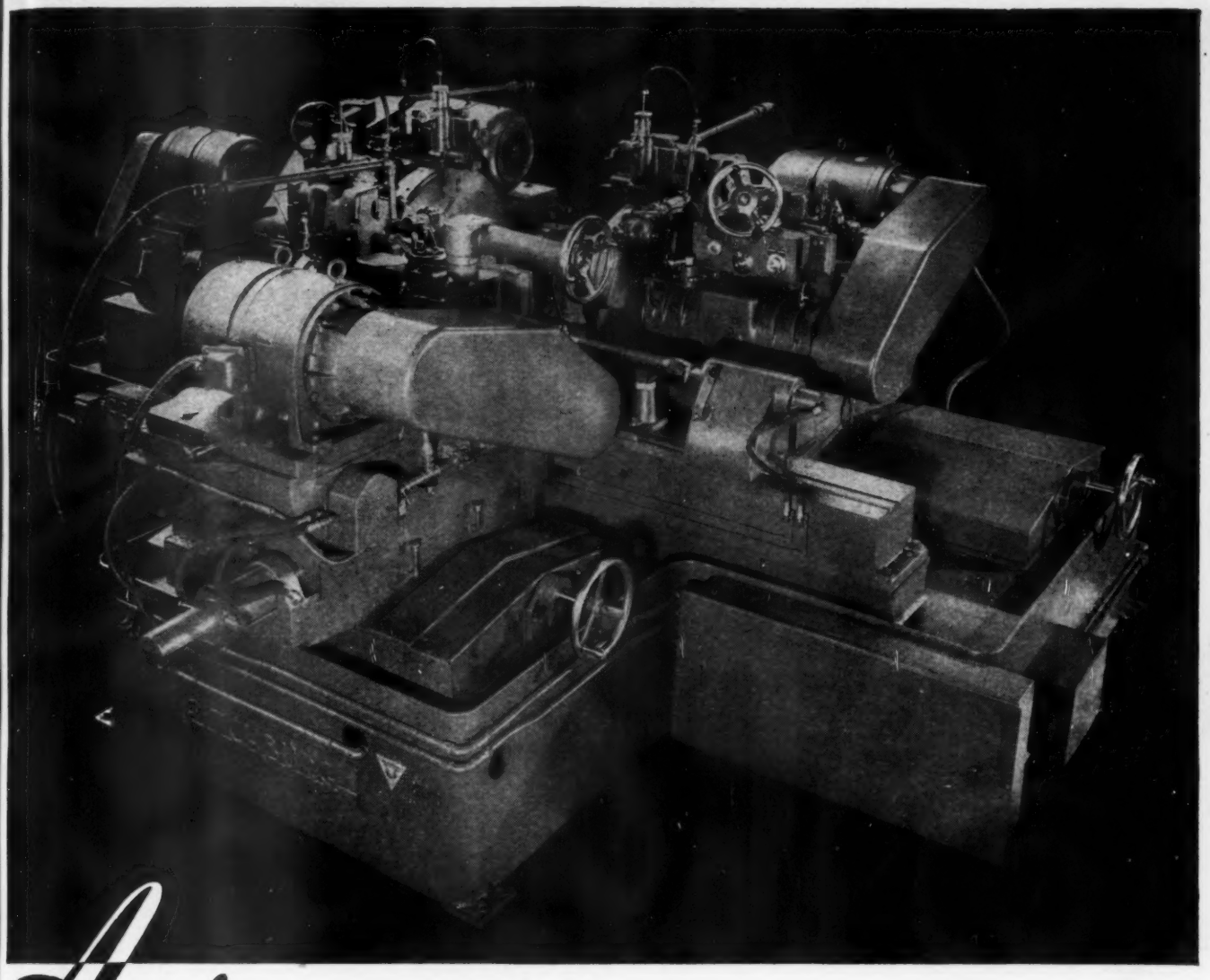
DU PONT

DU PONT SOLVENTS



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Get the complete facts. The open engineering mind instantly makes a favorable comparison between Fitchburg automatic precision grinding and any other equipment on the market! Install the Fitchburg method now and use your "Head" to cut costs and speed production.

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A triple-head Fitchburg Grinder like this may be converted into one double-head grinder and one single-head grinder, or three single grinders. Heads are interchangeable — save your investment.

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NEW ACCURATE SWIVEL RAM HEADS

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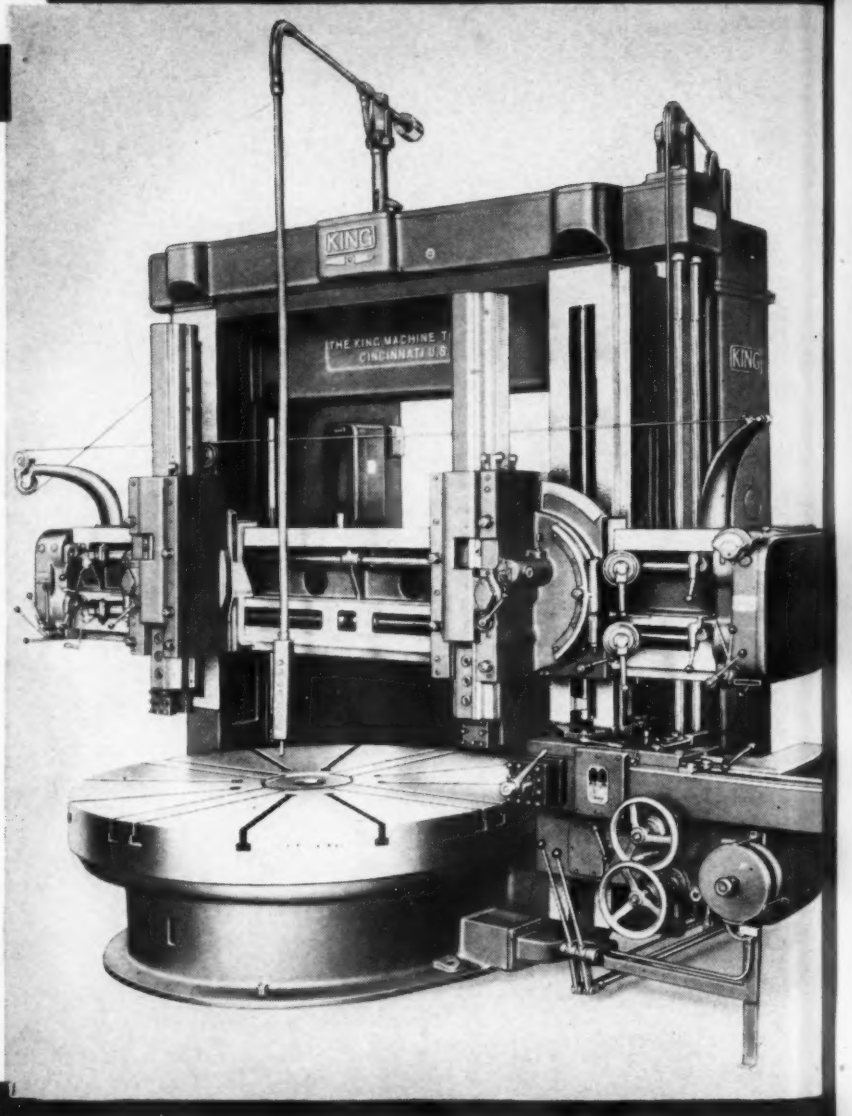
IMPROVED APPEARANCE

The New Series

KING

VERTICAL BORING AND TURNING MACHIN



● There are many reasons why the new series of King Vertical Boring and Turning Machines will give you added production at lower costs.

They're Easy to Operate. Every single control lever is located to the front of the machine—completely accessible. It makes no difference whether he is changing feeds, table speeds, or making head adjustments, your operator has the control within arm's reach.

They're Accurate and Powerful. A substantial increase in weight plus new massive, rectangular type ram heads will give you the rigidity carbide tools demand. Four gibs and eight bearing surfaces in the rams assure high standards of accuracy.

King offers the widest selection of general purpose Vertical Boring and Turning Machines available in this country. The new series include ten sizes and will handle diameters up to 144".

30" and 36" can be equipped with one head on rail, with or without side head, and 42", 52", 62", 72", 84", 100", 120", and 144" sizes with one or two heads on rail with or without side head.

For a half century King Vertical Boring and Turning Machines have demonstrated their ability to give long service at consistently low maintenance cost. It will pay you to investigate the new series.

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CINCINNATI 29, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

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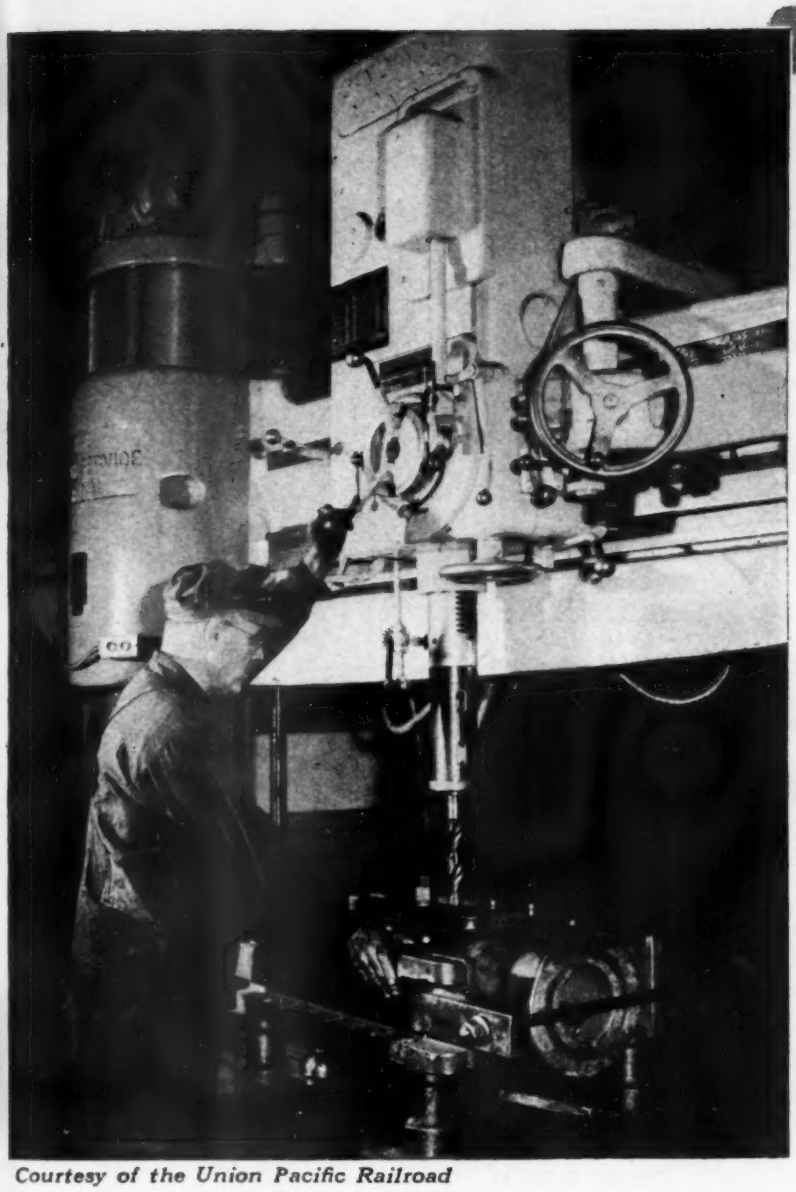

Courtesy of the Union Pacific Railroad

A locomotive crosshead has a job to do, and many miles of perfect performance are a must. Workmanship must be right.

This Cincinnati Bickford Super Service Radial Drill—accurate, dependable, easy and sensitive to the operator's control, is at work in a Union Pacific Railroad shop at Omaha, Neb.

Design features of Cincinnati Bickford Super Service Radial Drills make them profitable machines, either in high production work, or where versatility is needed.

Write for detailed Bulletin R-24A.

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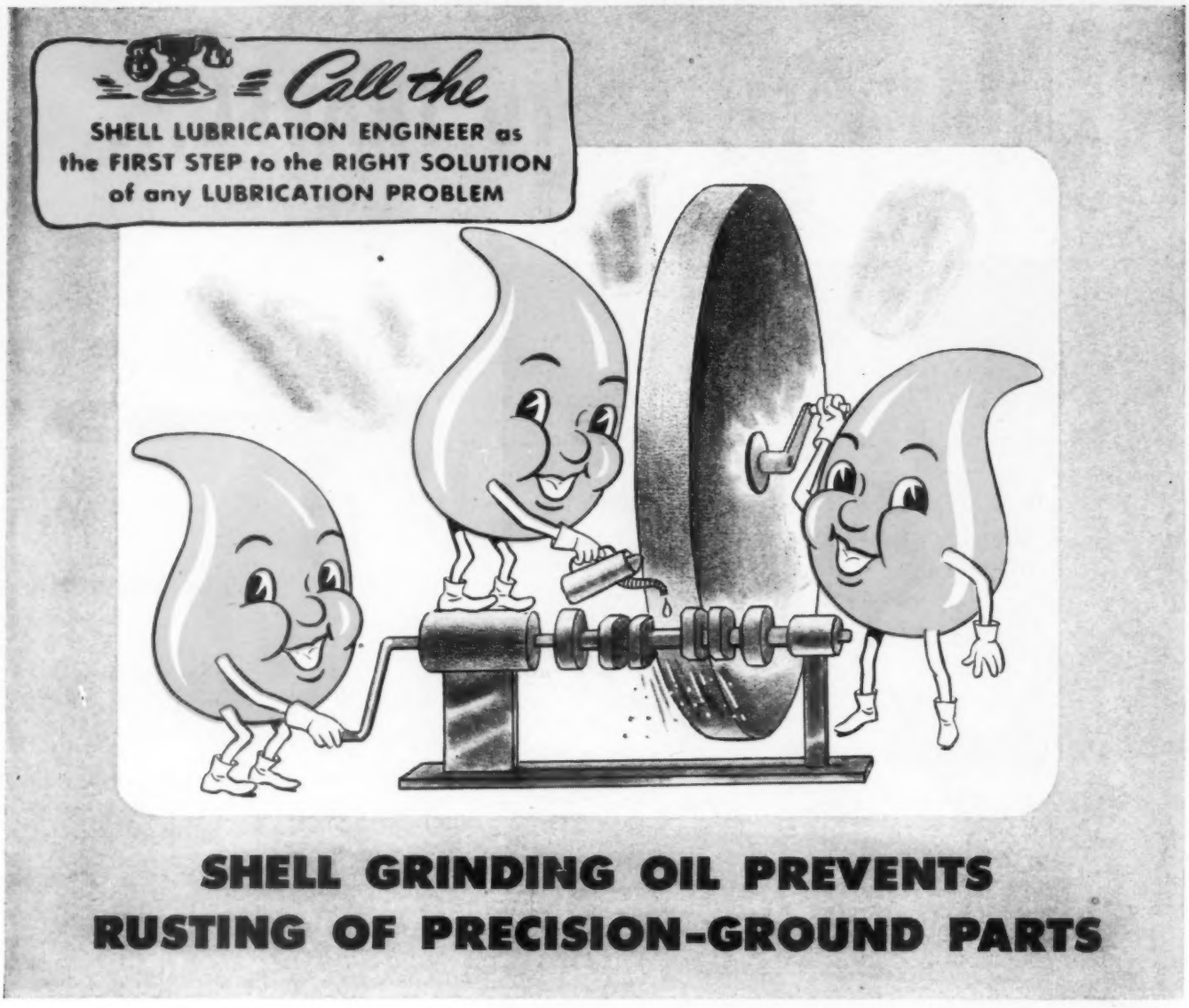
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.



SHELL GRINDING OIL PREVENTS RUSTING OF PRECISION-GROUND PARTS

PROBLEM: Manufacturer of tiny precision parts found he could get required finish only by using a combination of special wheels together with a special grinding oil which was lacking in protective properties. The special wheels were a nuisance, but the real problem was the quick rusting of parts finished with this grinding oil.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem, he suggested this test, which was made:

1. A grinder, equipped with standard wheels, was used with Shell Virgo Oil as the grinding fluid to produce a panful of the parts in question.
2. These parts were then set aside . . . the coating of Shell Virgo Oil their only protection against rust.

At the end of two months, no sign of rusting could be found. The manufacturer pronounced the finish obtained with standard wheels satisfactory . . . and ordered Shell Virgo Oil for all grinders.

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. For informative literature on Metal-Working oils, write Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, N. Y.; or 100 Bush Street, San Francisco 6, California.

SHELL METAL-WORKING OILS

For every metal . . . for every operation

SHELL

American Machinist's Spot NEWS OF METALWORKING

Producers of electric motors will not catch up with orders for 36,000,000 fractional hp. units until 1948, although August output was 1.7 million, twice the 1939 rate. Despite six new manufacturers in the field, shortages of silicon sheet steel and copper wire will hamper output.

Expediters from customers plants are being refused admittance by at least one automotive parts maker, who says flatly that his executives have their hands full trying to get out production and haven't the time to argue with outsiders.

Turkish Purchasing Mission is in America to purchase equipment for eight new factories, including a large general machine works at Ankara. Also, in the program is a pipe drawing factory, a special steelmaking plant and sheet iron, wire and tinplate factories. Head of the mission is Bulent Buktas, assistant general manager of Sumerbank, Turkish state bank.

Buda Co., Chicago, has switched most of its engine production from gasoline to diesel models, including a diesel-powered air-conditioning unit for passenger trains, which can be built into new coaches or used to convert old coaches. Buda is experimenting with small diesel air-conditioning units (as low as 5 hp.) for use in non-electrified areas.

Refrigerator makers are worried about diversion of pig iron and castings into the housing program. They say that unless government directives are modified, the entire mechanical refrigeration industry will have to shut down.

British are expected to announce a trade pact with Russia any day, under which they will sell the Soviet machine tools and other industrial equipment. Settlement of a 1941 Russo-British agreement for civilian items, such as electrical equipment, paved the way.

Poppet jet engines will be used for commercial airliners in the future instead of straight jet engines, predicts leading engineer. Former are more efficient and economical to operate than the latter, which have the advantage of higher maximum speed.

Auto industry plans the largest die programs in years. Orders for dies will probably start coming through in late November and December. Dies may cost 50% more in the Detroit area.

An unusual labor contract provision in the agreement signed by Aetna Ball & Roller Bearing Co., Chicago, with the United Farm Equipment & Metal Workers Union (CIO) contained a union promise to provide increased production.

Alleviating factor in the railroad freight car jam has been the rising output of motor trucks. August production at 105,500 units hits a new peak.

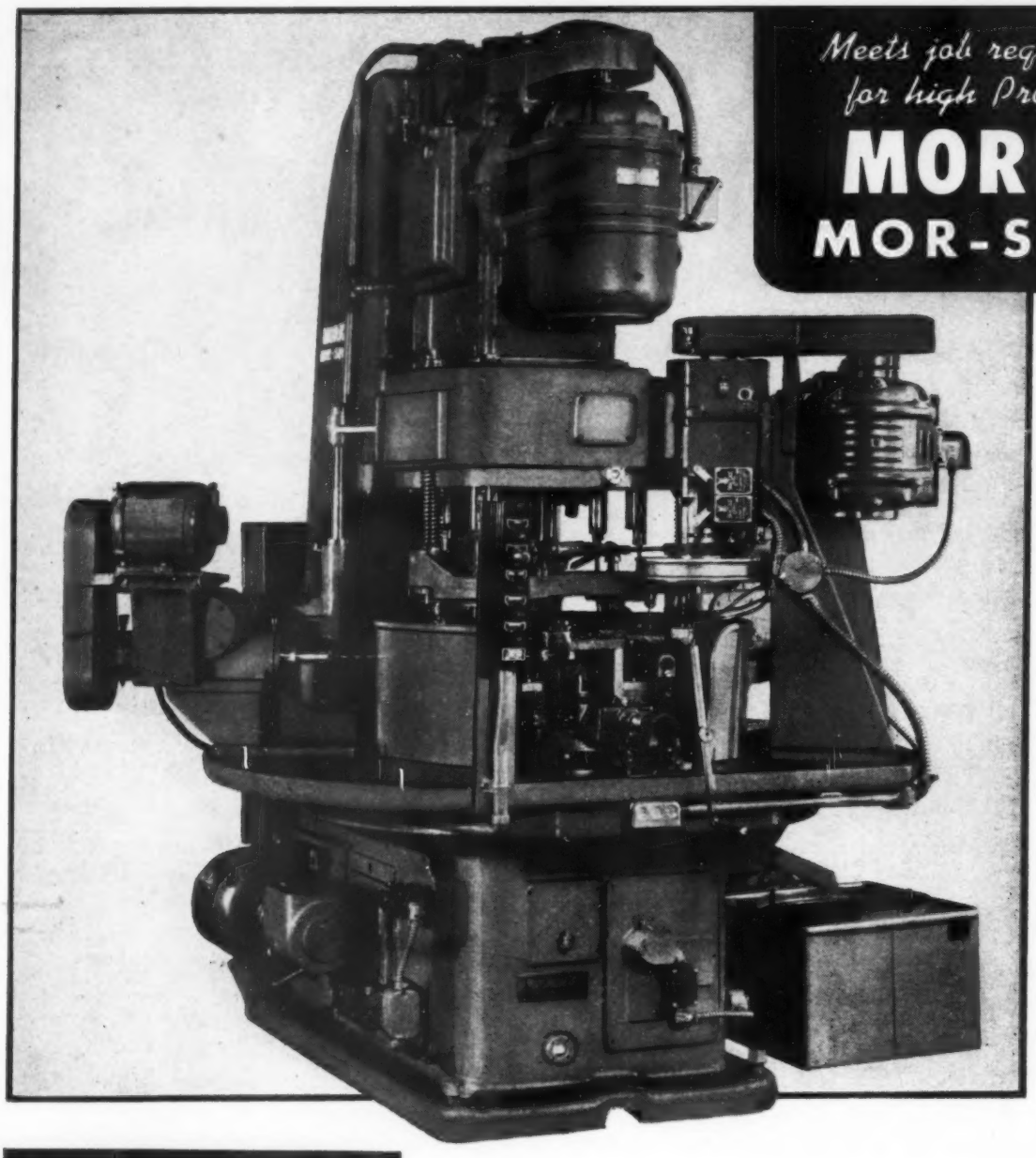
To reduce absenteeism, the Guardian Electric Co., Chicago, is paying overtime to workers above a 35-hour base, instead of the standard 40-hour basis. During the first week of the plan, absenteeism dropped 50%.

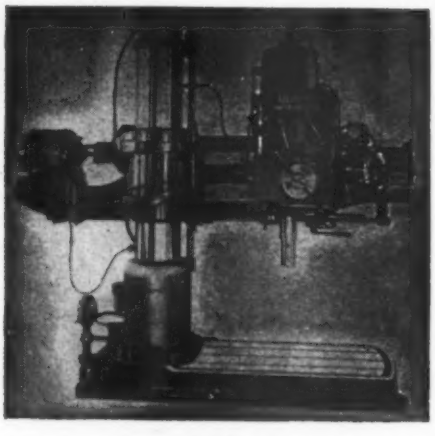
French machine tool buyers, impatient at delay in getting credit here with which to purchase sorely-needed equipment, are reported flirting again with British builders.

New England manufacturers of machine tools and similar equipment have been hard hit by the iron shortage. Many plants were preparing to shut down as this was written. Companies are using district representatives to search out pig iron.

Meets job requirements for high Production

MORRIS MOR-SPEED





● This machine was designed and built by Morris to meet specific job requirements. It is a Hydraulic Vertical Six Station Automatic Indexing machine arranged for drilling, reaming, countersinking, counterboring, and tapping operations. There are 16 vertical spindles—2 horizontal spindles—and 1 tap head with 3 spindles. The operations listed are performed on auto transmission parts. When your work calls for similar operations and high production at low costs consult Morris. They have the engineering "know how", experience and facilities to help you.

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

Aesop's Horse and the CIO

A stag and a horse were grazing in the same meadow. The horse didn't like the stag and wished to get rid of him. So he asked a man to help him.

"Yes," said the man, "but I can only do so if you will let me put a bridle in your mouth and mount you."

The horse consented, and the two together turned the stag out of the pasture. But when that was done, the horse discovered to his dismay that in the man he had got a master for good.

Recent actions of the Congress of Industrial Organizations in soliciting aid from the government in getting what it wants from industry remind us of this fable by Aesop.

The CIO has established an all-time record in appealing to Washington in labor crises. First of all, it has had the Wagner Act as a strong prop. In addition, the White House has lent aid and comfort at critical times through many years. Witness Mr. Truman's veto of the Case Bill.

CIO leaders learned that if they would appear to be tough enough, somehow the federal government managed to figure a way out of any strike or threatened strike with profit to CIO interests.

What is more, if all of CIO's tactics did not bring success in a strike and failure loomed, union officials were quick to ask the government to bail them out by taking over and operating the company affected.

It all sounds like gain for the CIO. But is it? Does the CIO really wish to entrench government in a solid position in the middle of labor-management relations? That is exactly what it is doing.

What guarantee does the CIO leadership have that government always will be such a bosom buddy? Will the government politely bow out when the CIO wishes it no longer to be a party to its negotiations with management?

Fear that government may eventually take over and dictate to labor as well as to industry keeps the American Federation of Labor from following in CIO's footsteps.

We believe that the CIO might well pause and consider whether it is right. Perhaps it will be smart enough to realize that the AFL has shown rare judgment and excellent foresight in wishing to keep Washington on the periphery instead of in the middle.

CIO leaders should gather in a serious huddle and debate the wisdom of deliberately getting themselves and all of labor into the position of Aesop's horse.

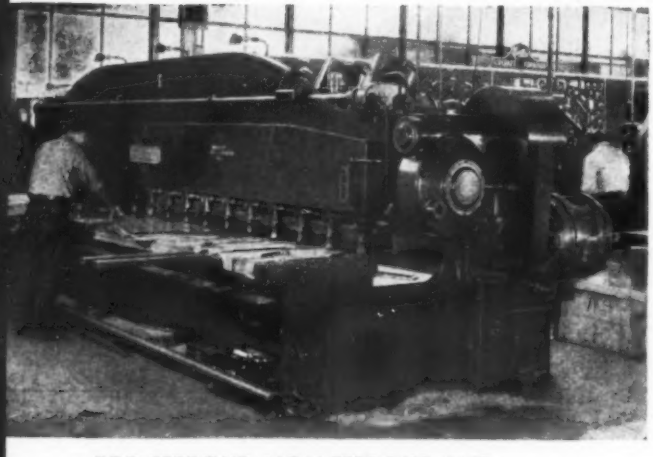
In their eagerness to use the government for their own purposes, they are in a fair way of getting a master for good. In so doing they are performing a disservice to industry, to their own people and to American democracy.

Burnham Finney

Use a SHEAR

FOR ARMOR PLATE AND ALLOY STEELS

FOR HEAVY PLATE



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The clean-cut job is the profitable job. Shearing square, shearing straight, shearing to close tolerances—lowers cost of forming and smoothes the assembly.

Cincinnati sheared blanks in many cases eliminate expensive blanking dies.

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THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Dies Harden in Passing

BY J. A. SCHAEFER, DREIS & KRUMP MANUFACTURING COMPANY

HIGH-FREQUENCY induction-heating equipment with sensitive electronic controls has made it possible to induction-harden selected surfaces of press-brake forming dies progressively from one end to the other. Before this equipment was installed, Dreis & Krump press-brake forming dies were machined from steel similar to SAE 415. This steel was heat-treated before machining to a Brinell hardness of about 250.

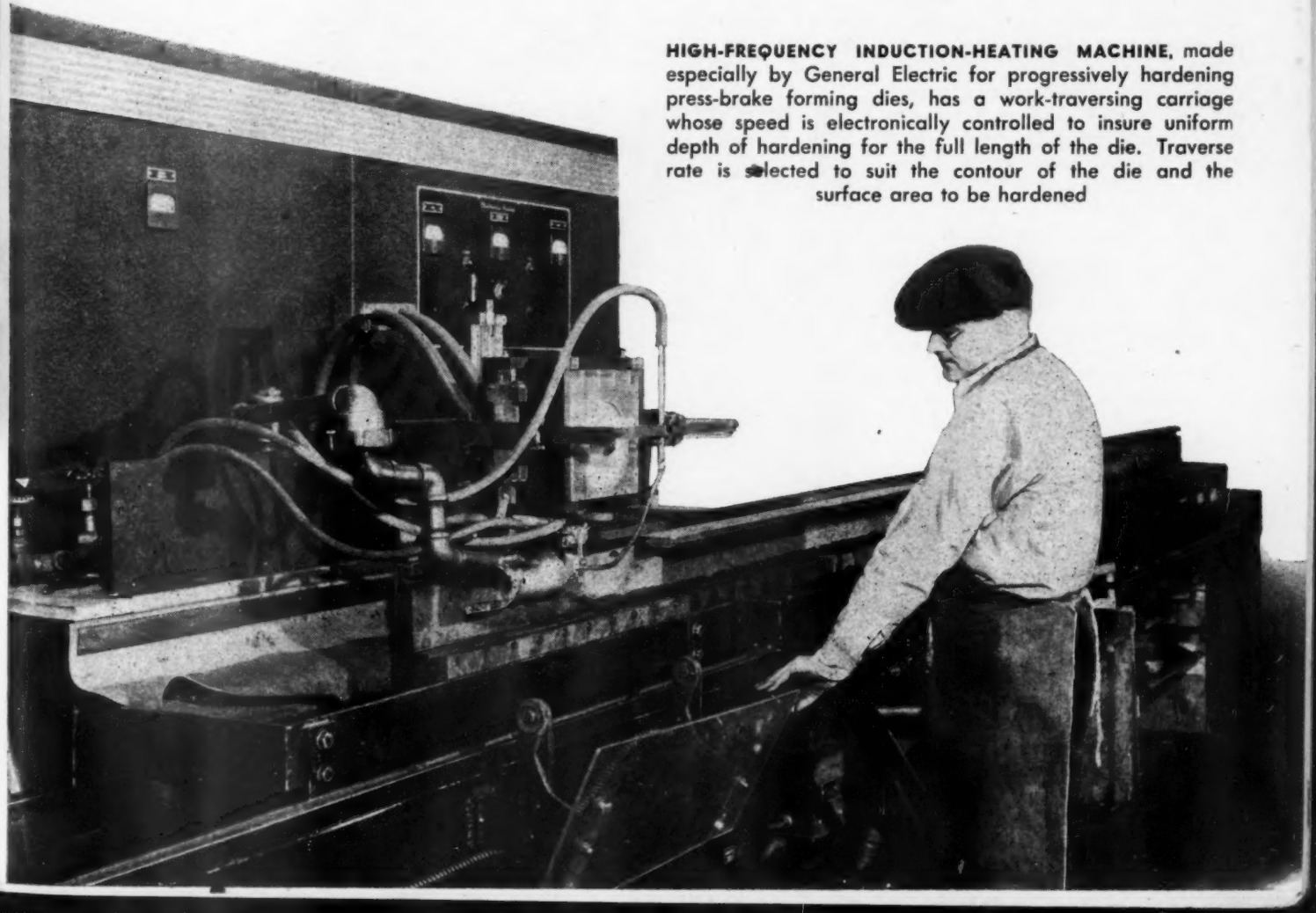
The machined dies are now hardened on the surfaces subject to pressure and wear, at a production rate considerably higher than would be possible with other methods of hardening. In addition, they are

Progressive induction heating with electronic control gives uniform hardening on surfaces subject to pressure and wear, saves in cost of materials

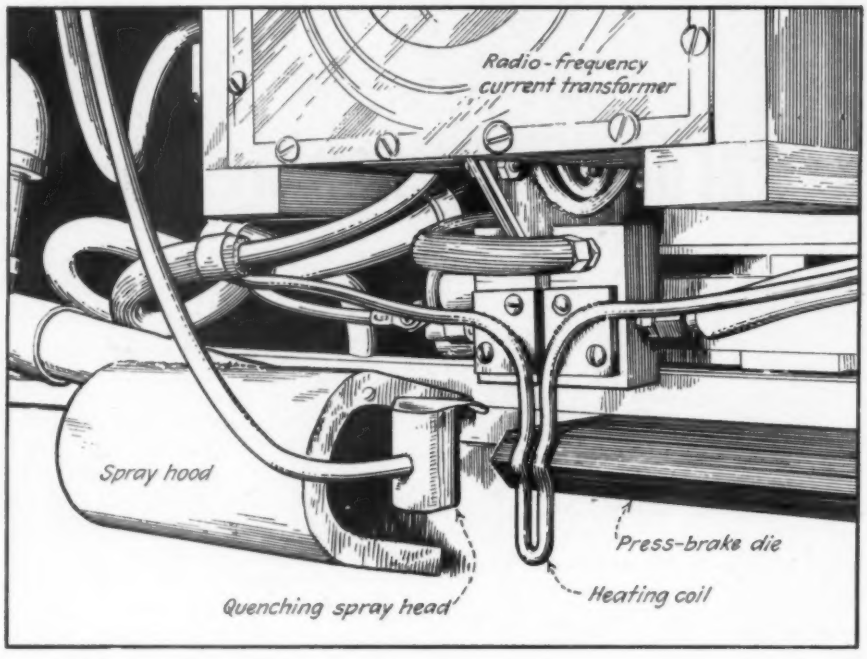
made from less expensive steel (0.40 to 0.50% carbon) which is easier to machine than the alloy steel previously used, and a much superior product is obtained.

Working surfaces on the die faces are hardened to about 48 to 52 Rockwell C, with depth of hardening accurately controlled. A sensitive "Thy-Mo-Trol" electronic device, correlated with the heat output of the work coil, automatically regulates carriage feed to provide a uniform hardening depth for the full length of the die. The operator selects the proper carriage travel rate for the depth of hardness desired and then connects the electronic speed-control unit to insure a uniform product.

The work-traversing carriage has capacity for dies up to 14 ft. long; longer dies have been hardened by using two or more settings of the die on the carriage. Carriage speed



HIGH-FREQUENCY INDUCTION-HEATING MACHINE, made especially by General Electric for progressively hardening press-brake forming dies, has a work-traversing carriage whose speed is electronically controlled to insure uniform depth of hardening for the full length of the die. Traverse rate is selected to suit the contour of the die and the surface area to be hardened



HEATING COIL FOLLOWS DIE SHAPE

Heating coils for male press-brake forming dies follow the contour of the die edge so the bottom surface is hardened at the point of greatest wear. Coils for male dies are spaced about 0.018 in. from surfaces to be hardened

DIES HARDEN IN PASSING (continued)

can be adjusted from 0 to 15 fpm. Male dies usually are hardened at 5 to 6 fpm., while female dies are hardened at 3½ to 5 fpm.

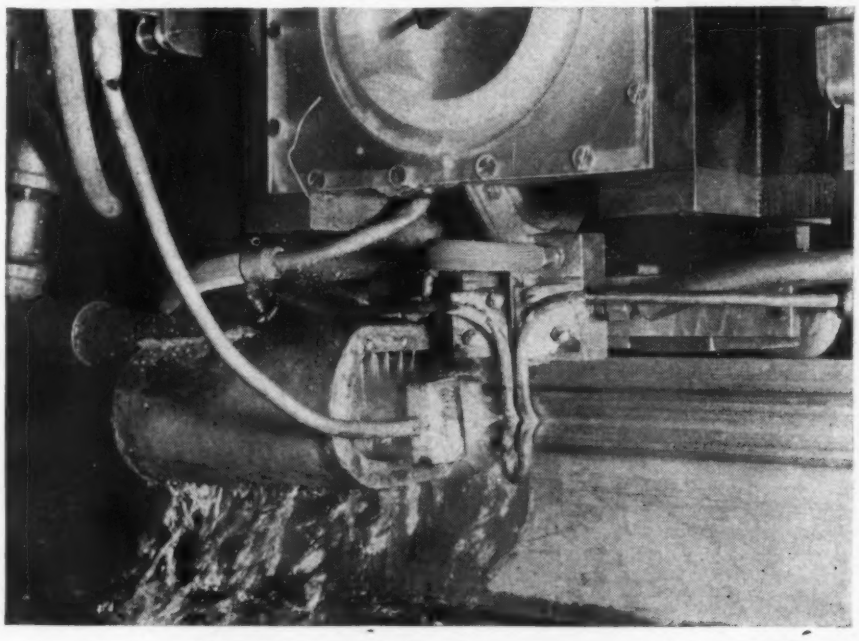
Because the rate of heat transfer varies considerably with changes in die contour, the operator must preselect a carriage speed which will produce the desired results in each die. Male dies with acute angles, for example, may be hardened at 8 ft. per min. or more, while obtuse-angle male dies are hardened at considerably slower speeds.

Heating coils are made from ¼-in. dia. copper tubing, with each leg brazed to 1 × 1 × ¼-in. copper connection blocks drilled for mounting on the heavy copper terminals of the radio-frequency current transformer. The transformer is mounted as close as possible to the work so power loss in the leads to the heating coils can be held to a minimum.

Design of the heating coils is critical for most jobs. The coil legs must be at least 3/16 in. apart and as short as possible from the transformer output terminals. When considerable area on the die is to be hardened or when the gap in a female die is 1½ in. or more, experience has shown that best practice is to harden separate areas with different coils, traversing the work past the individual coils in separate operations. If this is not done, there may be as much as 1 to 2 points difference in Rockwell C hardness between the two hardened areas.

The General Electric electronic high-frequency equipment is of 40-kw. capacity at 50,000 cycles per second. Maximum coil current is 380 amp. radio frequency, but it is normally used at 280 to 310 amp., with about 5 volts across the plates.

Minor variations in location of heating coils with relation to work surfaces result in considerable variation in heating of the work and the hardness obtained. To eliminate these variations, the radio-frequency



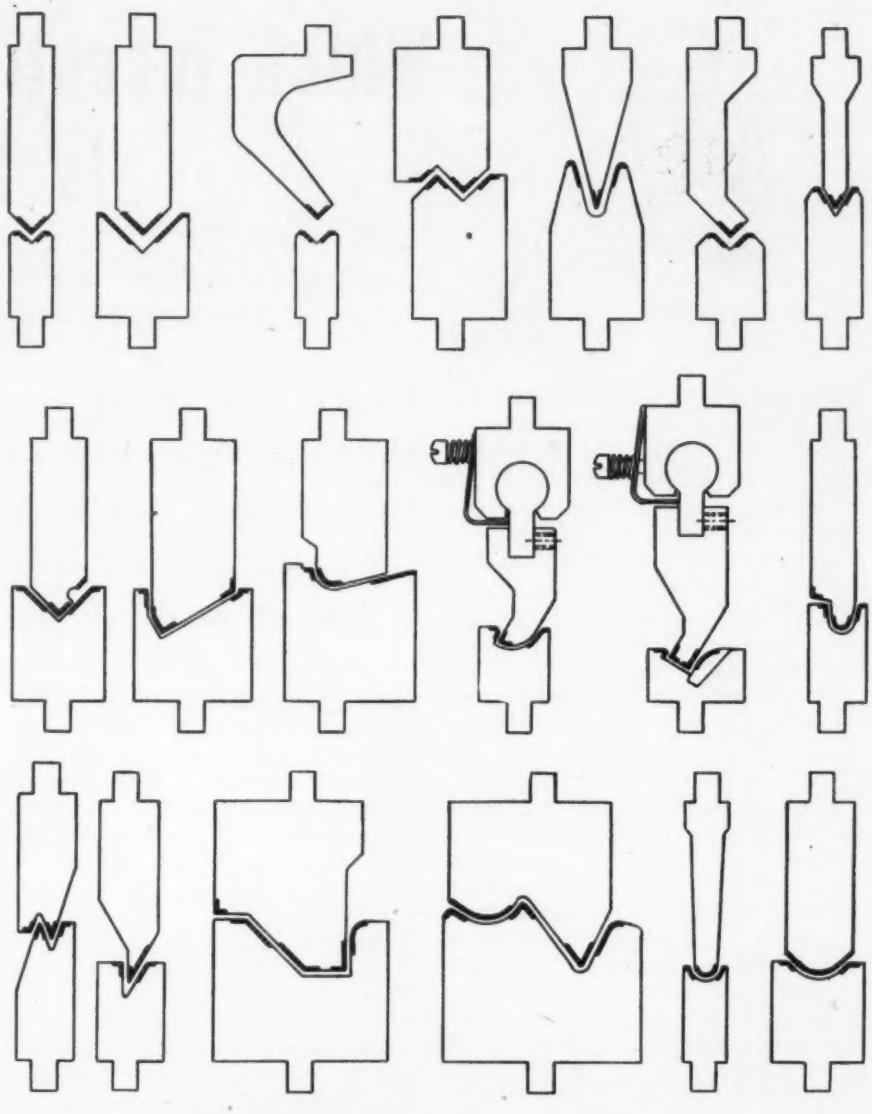
Quenching and cooling sprays are operated at a pressure of at least 40 psi. Heating coils for such female dies usually are spaced about 0.030 in. from the surfaces to be hardened, depending on the shape of the die and the hardness desired

current transformer is supported on an adjustable head carried on rollers. The rollers are guided in a V-groove machined on the top surface of the carriage fixture in which the work pieces are clamped. This eliminates the need for flexible connections between the output terminals of the current transformer and the heating coil.

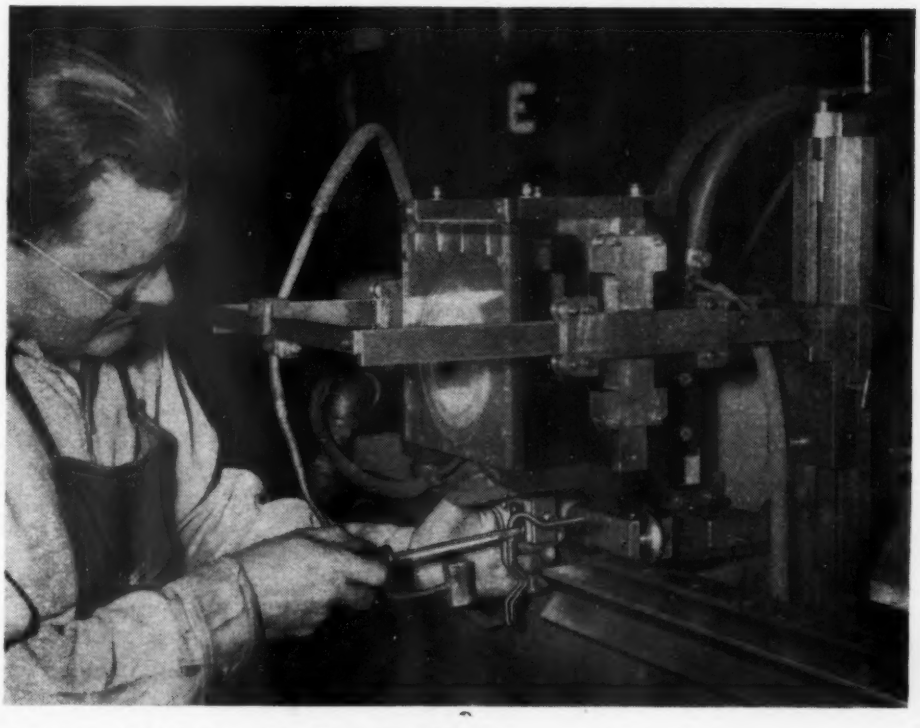
Heated areas on the surfaces of the work are quenched almost immediately by a small water spray suspended from the frame that supports the current transformer. Beside this quenching spray head is a larger water-spray jacket for cooling the work to room temperature after it has been quenched. Interlocking controls make it impossible to operate the machine unless water pressure to the spray heads and heating coils is 40 psi. or more. The quenching spray head is positioned so the stream of water from this head does not flow directly into the heating coil, but is directed on the work as close to the heating coil as possible.

To prevent the coil from getting too hot, cooling water obtained from the same circuit as water for the quenching and cooling sprays is circulated through the coil.

For efficient hardening, spacing between the heating coil and the die being hardened must be controlled closely. Coils for male dies are spaced approximately 0.018 in. from the surface to be hardened, whereas coils for female dies are spaced about 0.030 in.



↑ High-frequency induction heat-treating of press-brake forming dies makes it possible to harden only those surfaces subject to pressure and wear. Depth of hardening is determined by shape of the heating coil, its distance from the die surface and the rate of work traverse



← Heating coils are attached to the output terminals of the radio-frequency current transformer, which is mounted on an adjustable head supported on rollers. A V-groove in the top surface of the carriage fixture guides the rollers to eliminate variations in coil spacing

Which Incentive Plan Is Best For You?

BY H. BARRETT ROGERS, PROFESSOR OF INDUSTRIAL MANAGEMENT
THE SCHOOL OF COMMERCE, NORTHWESTERN UNIVERSITY

Financial incentives may mean high productivity and decreased cost of product. This article treats basic plans as applied to different classes of work

BETTER WORK, or more of it, is the only way a person can earn more money without raising costs and thereby harming himself in the long run. "More pay for less production" is the surest road to a breadline. More efficient production, and an honest share of it for everyone responsible, is the only hope for continued prosperity.

Under the term labor, the employer buys many different factors such as physical skill, mental ability, responsibility, good morale, ingenuity, loyalty, the will to work, enthusiasm and leadership. Wages alone can not buy all these factors, but other things being equal, high wages usually will buy more of them. Financial wage incentives therefore often are used to increase the monetary reward for increased production. To be sound, a wage-incentive plan also must reduce the cost of the product.

Indirect Financial Incentives

Indirect financial incentives include such arrangements as company-wide profit-sharing plans, plant-wide bonus plans, informal Christmas bonuses and provisions for extra income through employee ownership in the company. Under such plans, the increase in earnings gained by the individual worker does not depend directly upon his own increase in output, but rather upon the combined efforts of large groups. It is possible for an individual to receive increased earnings when his own relative output may have decreased.

Christmas and other informal bonuses are indefinite and usually are subject to the whim of the owner or manager. Although such bonuses readily are accepted by the employee, they are ineffective as an incentive toward increased production.

Company-wide profit-sharing plans serve a useful purpose in maintaining an economic balance between wages, prices and profits resulting from the over-all prosperity of the company. A good profit-sharing plan provides an equitable distribution between the owners' interests (dividends), and the wages and salaries paid to the employees. Such plans should not and can not satisfactorily replace direct financial incentives.

From a social viewpoint, a general defect in profit-sharing plans is the fact that in periods of depression, when the employee needs extra income to make up for the loss in his direct productive earnings, the company's profits also are reduced or eliminated and a profit-sharing bonus no longer can be paid. During periods of prosperity, profit-sharing bonuses inflate productive earnings, and for most persons this means an inflated standard of living which makes the following depression that much more difficult.

Profit-sharing bonuses might better be placed in drawing accounts or profit-sharing reserves to be paid out during depression periods.

Direct Financial Incentives

Direct financial incentives are those which tend to pay the worker soon after, and in proportion to, his individual production. Although there are many detailed variations in specific applications, there are only five or six basically different direct financial-incentive plans. Each has features not contained in the others.

For an adequate comparison of direct financial-incentive plans, a few rather definite concepts must be kept in mind:

1. Some specific level of speed, or effective effort, must be accepted as *standard*, or 100%. Much confusion and many differences of opinion exist among industrial engineers in regard to what level of performance should represent standard; that is, whether it should be set at the level of *daywork* performance or at the *high-task* level.

For the purpose of this discussion, 100% or high-task standard rate of performance is that performance displayed by a normal worker under the following conditions: The worker is physically and mentally suited to the job. He has been trained properly and is familiar with the specific operation. He works with tools, equipment, materials and surroundings that are maintained in good condition. Output is not restricted by psychological influences. He is working under the stimulus of a suitable, fairly administered and effective wage-incentive plan, but not at a sustained rate that would cause excessive fatigue or impair his mental or physical health.

Under this conception of standard, a majority of the trained workers will "beat" the standards by perhaps 5%, but seldom by more than 15%. Occasionally an exceptional operator may approach an efficiency ratio of 150% (50% above high-task level), but this 150% level seldom will be exceeded even by the expert. A few of the workers will have some difficulty in maintaining the 100% high-task level of performance.

2. By comparison, the daywork level of effort is that level usually obtained with straight-time or daywork wages. It usually represents the minimum acceptable level of effort which the worker must maintain to keep continuously employed, and if his output falls much below this level, he is likely to be discharged.

General production records indicate that this daywork level is between 60% and 70% (approxi-

mately two-thirds) of the 100% high-task level. Thus, daywork output frequently will be increased about 50% (of the daywork level) when the incentive plan induces the operator to work at the high-task rate of output.

3. Typical daywork performance usually contains much unnecessary idle or wasted time. Elimination of this idle time does not require any actual increase in working effort, nor does it result in any increase in fatigue. In fact, apparent fatigue often is less when the worker is productively occupied than when he is trying to "pass the time."

4. Time-study men who are familiar with the Bedaux and similar methods of speed-rating will recognize that the 80-min. (80-B) rate of output represents performance expected from a *normal* operator, and therefore corresponds approximately to the 100% high-task level. The 60-min. performance level (used as standard by the Bedaux and similar systems) mathematically is equivalent to the ratio of 60/80 or 75% of the high-task standard.

Therefore, plans for which standards are based on 60-min. performance levels are using standards which are only slightly tighter (67% to 75%) than minimum daywork levels. In other words, the standards tend to be rather loose, and the normal operator is expected to earn about a 33% bonus if he works a piecework or standard-time plan.

5. High-task performance requires considerably more effort than most operators are willing to exert unless such effort results in correspondingly higher earnings. The percentage of bonus (above guaranteed daywork wages), which is necessary to induce high-task performance, is called the *incentive factor*. Opinions vary as to the proper value of this factor. If the time standards are relatively loose and require only 75% of high-task performance (as in the Bedaux plan), the total earnings at 100% or high-task performance would be about 33-1/3 higher than daywork wages.

Some consultants recommend a 30% incentive factor. In other cases, an incentive factor as low as 10%, but coupled with good supervision, has given good results. The specific value of this incentive factor will depend upon local conditions, but in a great many of the older companies with well established incentive plans, an incentive factor of 20% appears to be about average.

6. The total earnings under the several plans can not be the same at other levels of performance because the shapes of the wage curves make it impossible for them to intersect at more than one common point. For greatest convenience in standardization of costs and production control, it is most logical for this common earnings point to be at the 100% high-task level.

7. The plan selected must be suitable for the type of work to which it is applied. No one plan is applicable to all types of work, and not all plans are suitable for the same type of work. The choice will be affected by the type of work, the specific working conditions, the availability of production records or measures of output and the ability of the time-study department to maintain adequate time standards.

Four Classifications of Work

Production work may fall into any one of four classifications: (1) Standard repetitive operations, (2) variable working conditions, (3) limited rates of production and (4) output not measurable.

Class I — Standard Repetitive Operations: In a very large proportion of productive work, the following conditions prevail. The amount of output varies directly with the effective effort, or speed of the operator. Output can be, and usually is, measured with considerable accuracy reasonably soon after the work is performed. Operations are reasonably repetitive. Methods are fairly well established. Materials, tool and working conditions are standardized and uniform, and a steady flow of work can be provided. Most repetitive manual operations fall in this classification. On such work, good time-study techniques usually result in accurate time standards which represent the high-task level of performance.

With tight rates, which are most desirable for cost and production control, correspondingly high incen-

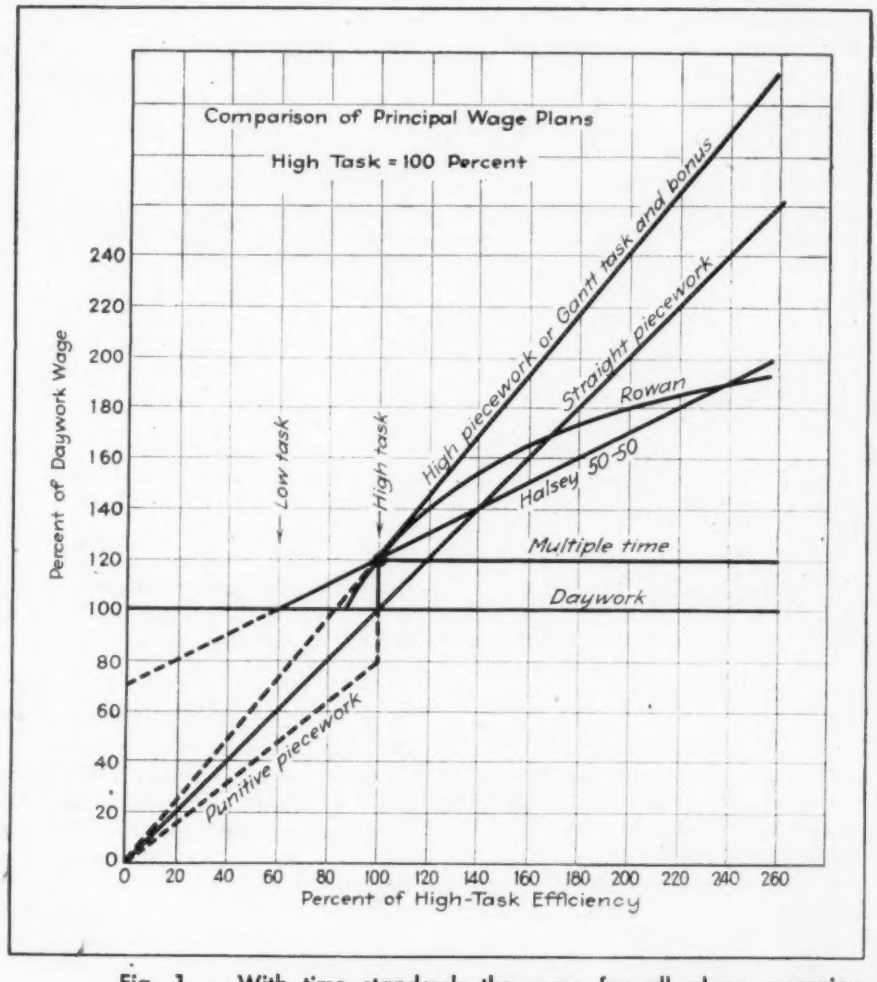


Fig. 1 — With time standards the same for all plans, assuming 100% efficiency to require the same level of effort in each case and including a typical 20% incentive factor, the six basic direct-financial-incentive plans permit the same total wage (120% of daywork) for high-task performance, regardless of which plan is used

tives must be paid. High-task piecework or standard time plans should be used with this class of work. Usually the daywork wages should be guaranteed, and a step bonus is most effective.

If the time-study techniques are not reliable, if the rates are loosened by including the incentive factor in the allowed times, or if for any other reason the standards may not truly represent high-task performance, the standards will be somewhat looser, and straight piecework, or a straight standard time plan (without the step incentive) should be used.

Class II—Variable Working Conditions: Much productive work falls into another classification, with several or all of the following characteristics. Output, as measured, increases in some variable ratio with the effective effort of the worker. But the rate of output may be affected by certain factors beyond the operator's control.

It may be impossible to provide strictly uniform materials, or surroundings, such as temperature, humidity, dust, noise and lighting, may affect the operation time. Previous operations also may not be well controlled. The mental agility or planning ability of the worker (a factor difficult to measure through time study) may have an important effect upon the time taken.

It may be impossible, impractical or uneconomical, to measure the operator's output directly in the same units as he produces, and there may not be a direct correlation between the units produced and the units measured.

On grinding, honing and certain other operations, slight variations in the amount of stock to be removed, resulting from non-uniform materials or from carelessness in previous operations, may cause the required time to vary, often as much as 300%.

With only partial correlation between the measured output and the amount of time required by a standard operator working at a standard pace, the allowed time standards must be loose enough to cover the time required under the poorest conditions. This is necessary to protect the operator against the effect of a run of non-uniform materials or unfortunate working conditions. But to protect the company against excessive costs when all conditions happen to be good and less time is required per unit, the operator should not be paid all the time saved on an undeserved loose standard. Thus, when rates are known, or expected, to be loose, or where nonstandard or variable working conditions make it impossible to get accurate and consistent time standards, some form of sharing plan must be used.

Class III—Limited Rates of Production: In certain types of work, the rate of output may be relatively fixed, or the maximum rate may be limited either by the capacity of the machine or process or by company policy. In such cases, the maximum rates of output usually can be determined with considerable accuracy, the standards tend to be relatively tight, and the output usually can be measured accurately.

The management may wish to encourage all operators to meet established standards of performance without encouraging capable individuals to make extremely high earnings which often cause dissatisfaction among other less capable operators. Or the management may wish to protect certain workers against their own desires for higher earnings. In some cases, these desires have caused conscientious workers (especially women) to maintain such a high pace that they have become physically and mentally disturbed. It must be recognized, therefore, that certain conditions justify the limitation of production by company policy.

In this class of work, the wage plan should encourage the operators to maintain optimum working conditions in order to utilize the maximum normal capacity of the process, yet it should not encourage shortcuts or speed-ups which may result either in reduced quality or possible danger to the operator's physical or mental health. A step-incentive, paid when the operator reaches 100% of the standard attainable rate of production, will encourage the operator to maintain that rate.

A two-level dayrate plan, sometimes called a multiple-time plan, provides this step bonus, without the stimulus toward exceeding the practical limits of the process. It is a strong incentive plan, with nearly all the advantages of the more complicated plans; yet the payroll calculations are nearly as simple as for straight daywork.

Class IV—Output Not Measurable: On some types of work, there are no accurate or convenient methods of measuring the worker's output, and such output does not bear any close relation to the worker's effort. Typical examples include research, development, inventing, learning and general planning activities, in which the apparent accomplishment does not, necessarily, indicate the effort expended. Without some means of measuring output, wages must be paid on a straight-time basis, such as by daywork or salaries.

Most shop operations, involving either direct or indirect labor, can be measured with sufficient accuracy to justify the use of some form of direct financial incentive, but few companies have taken the trouble to learn how well clerical operations also respond to standardization and incentives.

Specific Wage Plans

Daywork is the simplest form of wage payment. It has few other advantages and is not, by itself, a direct financial-incentive plan. It should be used only on Class IV work where it is impossible or impractical to measure the output of the worker. Earnings per hour remain constant, regardless of the operator's rate of output. Except under the best supervision, this level of output will remain near the minimum level acceptable for continuous employment, regardless of the actual amount of wages paid.

Measured Daywork is still daywork. Management attempts to stimulate the workers by establishing standards as goals, and by measuring production against those goals. Such a plan requires all the clerical routine of a true incentive plan without obtaining comparable results, but it is helpful in determining standard unit cost on indirect labor, such as inspection, where speed-ups should not be encouraged.

Multiple Time or Double Daywork has the step bonus which provides a strong incentive for the

worker to reach and maintain the standard rate of output. Accurate standards and output records are required, but the plan is most effective when the rate of production should be maintained within a very narrow range near standard level.)

This plan is well suited to Class III work. Payroll calculations are simple. Efficiencies are determined by finding the ratio of total time allowed to total time taken. If ratio is less than 1.00 (100%), earnings equal actual time taken multiplied by base daywork rate. If the ratio is 1.00 or higher, earnings equal actual time multiplied by a high hourly rate. This high hourly rate is greater than the daywork rate by an amount equivalent to the incentive factor, which in this discussion is considered to be 20%.

Plan Permits Flexibility

The Halsey Constant Sharing Plan provides a means for paying small bonuses on relatively low levels of output. To accomplish this, loose standards are used and the plan therefore gives the operator only a share of the time he can save over these loose standards. This plan seldom is, and should not be, used if the rates can be set tight. Its chief advantage is the protective feature for the company when working conditions are highly variable and the time standards therefore are unavoidably loose. It is well suited for Class II work.

The sharing ratio may be altered to suit the conditions of the job. Instead of the 50% share originally used by Halsey, a 10% sharing plan has been used, very successfully, for storeroom attendants. The original Bedaux plan was merely a Halsey plan with a 75% share for the workers; but for the past few years most Bedaux installations have given the employees 100% of the time saved. This results in a straight 100% standard time plan, usually with daywork guaranteed.

The Halsey plan is relatively simple, and when the sharing ratios are varied to suit the type of work and the relative tightness of the time standards, it can be adapted to a wide variety of operations. Its principal weakness is its lack of a step bonus. Although it begins to pay bonuses at low levels of output, which appears to favor the less skilled workers, actually those bonuses are very small.

The plan therefore is very weak as an incentive, with no special inducement for the worker to achieve the high-task level of performance. In fact, because job standards are represented by loose rates, the operator has no way of knowing what a normal high-task rate of performance should be.

The Rowan Variable Sharing Plan gives the worker a variable share of the time saved, a feature achieved by using a bonus factor equivalent to the ratio of the time saved divided by the allowed time. Using this ratio to determine the percentage of bonus, a given level of performance will produce mathematically high efficiency ratios under loose rates, but the looser the rates, the lower becomes the worker's share of the time saved. With the original Rowan curve, the mathematical limit of earnings is twice the amount of the guaranteed daywork wages. This plan is well suited to Class II work.

If the management insists upon the use of only one plan, in a plant with a wide variety of operations, this plan has several advantages. The modified Rowan curve, shown in Fig. 1, provides a bonus which is 20% higher than the original Rowan curve, shown in Fig. 2. At efficiency ratios near the 100% level, Fig. 1 shows that this modified Rowan plan provides approximately the same earnings as high piecework.

It is therefore suitable where tight or high-task standards can be established. On the other hand, if loose standards occasionally are unavoidable, the reduced sharing feature of this plan provides the company with automatic, reasonable protection against unearned excessive wages and unnecessarily high costs.

Straight Piecework uses production standards in terms of a certain amount of money per piece, and therefore pays the worker directly in proportion to his measured output. The 100% Time Premium plan, sometimes called the Standard Time plan, gives earnings similar to straight piecework, but the production standards are in terms of time per piece instead of money per piece.

Next page, please

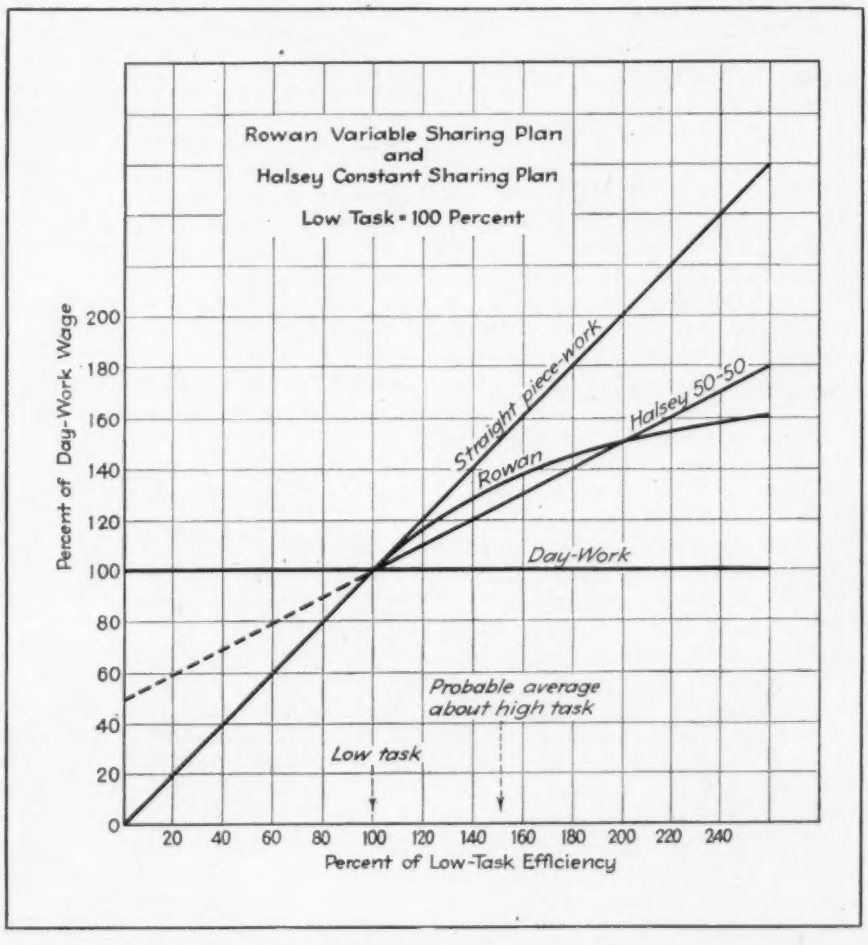


Fig. 2—Rowan Variable Sharing and Halsey Constant Sharing financial-incentive plans are compared above. Also shown is the curve for Straight Piecework which frequently but unwisely is used with loose standards. The data shown are based on the assumption that time standards were set loosely, requiring only low-task, or daywork, performance

These plans are suitable for Class I work, such as manual operations, or such as machine operations which require all the operator's time in active manipulation of the machine. Straight Piecework, instead of High Piecework, should be applied where standard working conditions can be maintained, but where the time standards are looser than, or about 80% of, high-task standards.

The High Piecework plan is obtained by granting an extra bonus for meeting the standards. The time standards usually are calculated very accurately for high-task performance, but then loosened by including the 20% incentive factor in the allowed standards. With this arrangement, the worker begins to receive a bonus when he reaches 83% of high-task performance. As shown in Fig. 1, this plan lacks the strong incentive of the step bonus to induce workers to meet the high-task standards.

The advantages of the step bonus can be obtained, however, by requiring 100% high-task performance before any bonus is paid. The 20% incentive factor is not included in the standards, but is paid through the use of a higher base rate, or through the use of bonus-factor tables. Production standards usually are expressed in time rather than money, daywork wages usually are guaranteed, and the plan is known as the Gantt Task and Bonus plan.

Comparison of Wage Curves

From the basic direct financial-incentive plans described above, a plan can be selected or developed that is suitable for any type of direct labor operation, as well as for nearly any type of semi-repetitive indirect labor or clerical activity. The earnings curves are compared in Fig. 1 on the assumption that the time standards have been set with equal tightness for all the plans, although this seldom occurs.

An efficiency ratio of 100% therefore is assumed to require the same level of effective effort and the same total output for all plans. For this amount of work, it is assumed that the operator should receive total earnings equivalent to 120% of, or 20% higher than, his guaranteed daywork wage. Bonus payments begin at different efficiency ratios, however, according to the specific plan.

To clarify further the effects of loose and tight rates, let it be assumed that a standard operator is available who will work continuously at exactly the 100% high-task rate of performance. At that point, he is to receive a total wage that is 20% higher than daywork. Now let it be assumed further that some error had been made either in calculations or judgment and the allowed time standard had become very loose. With no change in effort or output, the efficiency ratio (total allowed time divided by total elapsed time) would become very high, say 200%.

Rowan Avoids Excess Bonus

If High Piecework were in use, it may be seen from Fig. 1 that the earnings would be 240% of the daywork wage, instead of the 20% bonus that was intended. But with the automatic protective feature of the Rowan plan, the operator would receive a bonus of only 80% above daywork, and the company would have been protected against the excessive cost of such an error to the extent of 60% of the daywork base. This example has been exaggerated to illustrate the point, but exceedingly loose rates occasionally do occur in actual practice.

If there is any possibility, therefore, of having a mixture of loose and tight rates, or wide variations in working conditions, the Rowan plan with a 20% incentive factor will give equitable wages throughout the normal range of efficiencies, with good protection against excessive costs from unearned wages. However, if the work is uniform, and the time standards are set consistently to require high-task performance, the Rowan curve is difficult to justify and the High Piecework or Gantt Task and Bonus plan should be used.

The Punitive Piecework plan, shown in Fig. 1, was designed by Frederick W. Taylor and is known as Taylor's Differential Piecework plan. It pays the worker relatively low (less than standard) piece rates for all efficiencies below 100%, but pays a high piece rate for efficiencies at and above 100%. This plan punishes the slower workers, but richly rewards the good workers. The enlarged step bonus provides an extremely strong incentive for them to reach the 100% point.

Because this plan severly penalizes the beginner or naturally slow worker, it is unpopular, and rightfully so. If the worker's daywork rate is guaranteed for the low output obtained under daywork conditions, it certainly should be guaranteed on other types of plans where the average output will tend to be somewhat higher.

The Halsey 50-50 Constant Sharing plan originally was designed for use with standards based only on records of past performance. These obviously represented daywork performance, or approximately 60% of high-task effort. To protect the company against excessive costs on such loose standards, the worker was given a 50% share of the time saved.

A further relationship between the looseness of standards, and the proper sharing ratio, can be seen by rotating the Halsey earnings curve around the anchor point located at 100% efficiency and 120% wage. The intersection of this line with the Daywork line indicates the relative level of output required by the time standard.

If the line is rotated clockwise, the required output becomes lower, represented by looser standards, but the employee's share of the savings also is reduced. If the line is rotated counterclockwise, the slope of the line is steeper, indicating an increased share of the time saved for the worker, but the required output becomes correspondingly higher and and the rates tighter.

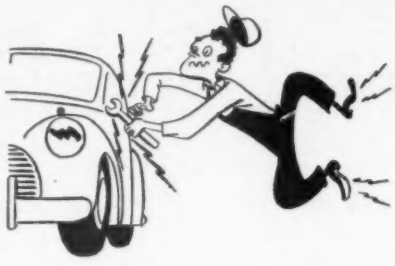
Tight Rates—High Earnings

When the employee's share becomes 100%, the Halsey line will coincide with the High Piecework line. Thus, when rates are tight, the employee's share of the savings must be high; and when rates are loose, regardless of the cause, the worker should receive a lower share of the apparent savings.

Except perhaps through the use of nationwide standardization of elemental time data, there is no precise method of measuring how loose or how tight a standard actually is. Only a general opinion can be formed, based on working conditions and type of operation, specific time-study techniques, the integrity and experience of the time-study personnel and previous records of achievement against similar standards.

Condensed from the chapter on wage incentive prepared for the author's forthcoming book on "Time and Motion Study." *All republication rights reserved by the author.*

TALKING SHOP



Lightning-rod Powder

CARS on Detroit assembly lines begin to build a static charge just as soon as synthetic tires go on—which shocks any unwary assemblers. Taxi drivers have found it necessary to rubber-tape door handles on synthetic-tired cabs to keep from shocking passengers. Chrysler has licked the trouble on the line by injecting about half a teaspoonful of dry powdered graphite into each inner tube through the valve (with the core out).

Fishing Guide

FISHERMEN will soon be able to get poles with line guides molded from carbides or machined from sapphire. Wear is many times longer, and guides are so smooth, line wear is also reduced.

Lower Pitch

PITCH is important not only in an airplane propeller; it means a lot in the fan blades on an automobile engine, too. Engineers, in redesigning the fan for the 1946 Ford, changed the pitch, widened the blade and got 5° cooler engine operation. Pitch of the new fan is 30°, compared approximately 36° in the old, and the new blades are 3.50 tapered to 3.25 in. wide, compared to 2.6 in. before.

Secret Weapon

A. B. EINIG, manager of Motch & Merryweather Co., Cleveland, was machine-tool consultant to the Pauley committee on reparations, which spent three months visiting enemy countries. The report that stands out most clearly in his mind is the remark for a former Jap general who was speaking quite frankly of Jap military deficiencies. He summed up with: "We neither overated nor underrated the power of your navy, your air force or the ability of your ground forces—what we were totally unprepared for was your bulldozers. We never knew about them until too late and were totally unable to cope with them."

Treat

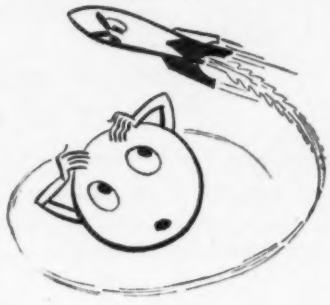
MONSANTO has announced a new sudsless laundry powder, a synthetic yellow soap that is claimed to work in hard or soft water. Wonder what will happen now to "Lots more suds with Supersuds"? And we hope breweries don't start using it.

Repeat Orders?

SPEAKING of foreign locomotive orders, one wonders just when repeat orders may be expected. For one thing they are ordering units in considerable quantity. Of major significance is the quantity of replacement parts being ordered. One country ordered enough replacement parts for next 25 years, and specified roller bearing for all driving wheels. (Most American and Canadian locomotives have plain bearings.)

Heat Beater

CARNEGIE-ILLINOIS Steel Corp. has done it again, this time with a 20-page, 5½ x 7-in. booklet called "Beat the Heat." It consists of alternating pages picturing the antics of "Roger Right" and "William Wrong" in summer weather. Roger is the early-to-bed, daily-vitamins type, but Willy is a stinker—at least according to the accompanying 4-line doggerels. Diet, rest, salt tablets and regularity seem to be the answer and an idea for you next summer.



Higher V-2

V-2 ROCKET has been sent to world-record altitude of 104 miles at White Sands. Horizontal travel was 69 miles. Now the Ordnance Dept. is on a still hunt for a range up to 2000 miles long. Incidentally, nose instruments from the high-altitude flight were recovered intact, so new information on cosmic rays, etc., will be available. Next record, with improved fuel, is expected to be 200 miles, mathematically equivalent to a 3000-mile flight.

Carte Blanche

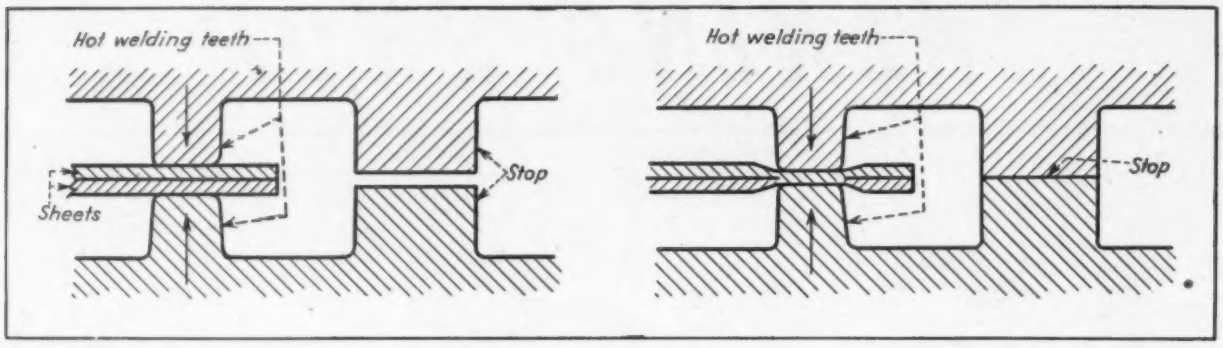
WHEN one of the larger American or Canadian railroads want a number of locomotives built, they provide blueprints and detailed specs and you follow these. This does not hold true for most of the foreign locomotive orders now pouring into this country from all over the world. From some of these countries comes an order for, say, fifty locomotives. For specs they provide track gage, tunnel dimensions and maximum rail curvatures. In other words they just want fifty locomotives—to fit these racks and go through their tunnels.

Which War?

THE OWNER of a small metalworking shop during the war years tells us of one of the most interesting people he met. It was the Chinese laundrymen who handled his plant laundry. One day during 1943, the shop owner was brooding over the length of World War II. Just about that time Charley drove up in his truck for the week's laundry.

"Say, Charley, how's the war going?" asked the shop owner.

"Tellible, tellible," says Charley, "eight years now."



THE PROCESS—Two thin, cold aluminum sheets are laid between hot welding teeth at *A* and pressed together to acquire the deformed condition at *B*. If a crank press is being used for welding, a suitable stop prevents excessive pressure. Such stops are unnecessary with hydraulic or toggle presses

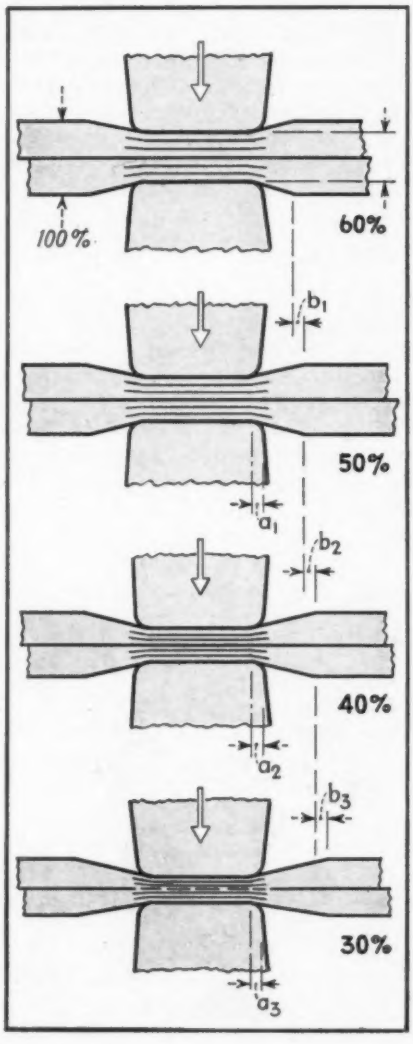
HOW TO PRESSURE-WELD HOLLOW PARTS

Comparatively low-cost dies and standard press equipment used in welding cooler elements for German aircraft engines suggest practical commercial application

ALUMINUM ALLOYS may be economically and rapidly welded with crank, hydraulic or toggle pressses and alloy-steel welding tools. This method, known as pressure welding, is particularly adaptable to mass-production of hollow articles such as cooler elements, radiators, heat exchangers and condenser parts. Double walls for barracks doors, ship walls and cupboard doors may also be produced in quantity.

The process described here has been developed for aluminum-alloy cooler parts and employs alloy steel dies with integral welding "teeth." As welding is carried out in the plastic condition of the metal, at high pressures, no cast structure is left behind. One theory of microstructure changes in the metal is that deformation by the hot teeth causes the crystals to break up and combine with crystals of the mating aluminum sheet. Because oxide skin on the aluminum (Pantal — 0.79Mg, 1.10Si, 0.85Mn, 0.39Fe, 0.02Ti, 0.13Cu, 0.15Zn, 0.05Ni, remainder Al) is practically unavoidable, it is difficult to determine anything experimentally about this.

Fundamentally, weldable sheet thickness is unlimited and work has been done up to 5 mm. Heating time increases very rapidly with increase in thickness and greater pressure is required. Deformation at the welded joint must be very definite to obtain a reliable weld. About 50% deformation is necessary in welding annealed Pantal alloy.



STEPS IN PROCESS—As deformation proceeds from 60 to 30%, the weld seam becomes thinner and finally disappears. Material squeezed from the weld zone is recognized by its waviness and its width is a measure of weld deformation, increasing from a_1 to a_3. Width of the extruded zone of metal along the length of the weld increases from b_1 to b_3

Hard-rolled sheet pressure-welds better than annealed sheet. Success of pressure-welding various aluminum alloys is greatest with hard-rolled A1-Mn sheets and pure hard-rolled aluminum. Pantal and the A1-Zn-Mg alloys are next in ease of welding. Pressure-welding of hydronalium is extremely difficult and dural and duralumin seemed unsatisfactory in research work completed to this date. Magnesium alloys cannot, at the present time, be pressure welded.

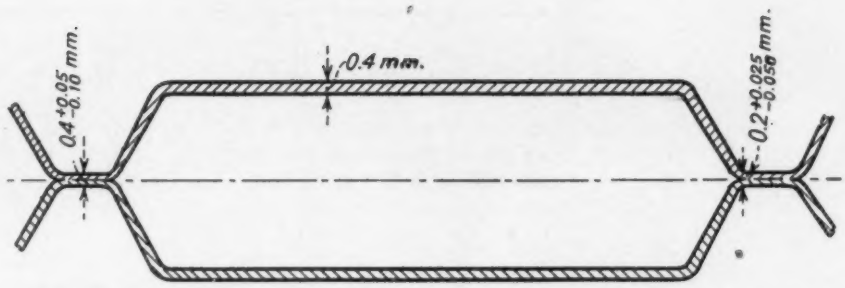
Welding dies, which are the heart of the pressure welding setup, should be made on a die-sinking machine and an alloy steel of 1.8-2C, 0.5Si, 12.3Cr, 0.45V and 0.5Mn analysis is most suitable. Such dies are capable of at least 750,000 operations on annealed aluminum alloy. Dies are

heated by conduction from removable steel blocks, fed by gas burners, and the press is protected from excessive heat by water-cooled plates. Compressed air prevents buckling of the work as the weld is made.

The necessary compressed air is obtained from blowers. Complete independence of pressure fluctuations in the gas and compressed-air systems must be arranged. The outer teeth of the dies and their two ends have a heat insulation of asbestos and sheet metal to ensure uniformity of welding. Without this the outer and most important tooth is colder than the inner ones and the two ends of the die are somewhat colder than in the center.

Dies are tested before heating to attain correct setting of upper and lower dieholders. In heating, the ram and bedplate blocks deflect together with the heating passages, as they remain cooler on the sides nearer the press than the dies. Amount of deflection depends on the temperature and, if it is altered during welding, additional deflection results. Compensation may be made by inserting steel foil between the upper die-holder and the upper die.

In practice, the die was left for 4 to 6 hr. at full temperature. One welded part was made to determine the thickness for the compensating layer of foil. Usually, because of the dieholder deflection, there is too much space in front and back of the weld. Two packets of foil, formed step-shape, are inserted over the upper die and altered after every pressure-weld until the over-all desired thickness is obtained. Inserts are then spot welded to prevent shifting.



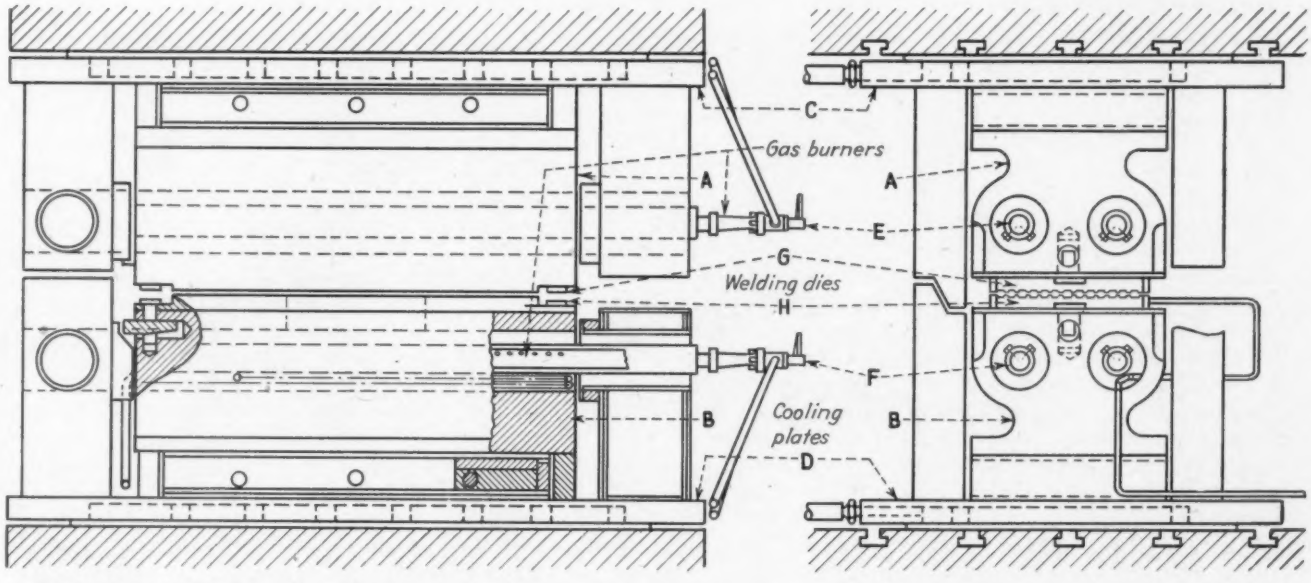
THE JOB—In fabrication of this cooler element, well suited to the process, two 0.4-mm. sheets of aluminum are laid between heated dies. Just as welding begins, compressed air is blown in to prevent buckling. The operation, including loading and unloading, is finished in 30 sec. Nineteen seconds of this time is taken up by handling, suggesting that in good mass-production practice, unit time can be considerably decreased

Compressed air should not be blown in too late or it will not press out any buckling which may occurr. Blown in at the time of the weld it positively prevents buckling. Air pressure should be between 170 and 256 psi., depending on the alloy and its thickness. Higher pressures split the elements or cause porosity and lower pressures permits buckling of the sheet. The air should be free from condensation and oil as both contain fatty acids.

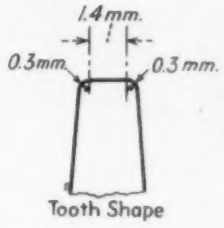
Die sets should be checked for faulty spots at regular intervals. Light aluminum alloy has a tendency to adhere to the die surfaces. It can often be seen near the edge of the welding teeth, particularly on large teeth. It is easily detected by its rough surface and white color, which contrasts with the black background of the steel. Dies may be cleaned by pickling them for 8 to 10 min. in hot caustic-soda solution.

Welding teeth which are too smooth increase the tendency of the component to stick to the teeth and it cannot be freed from a hard chromium-plated die at all. A definite roughness of the teeth, which cannot be obtained with machine tools, is required to prevent sticking. Teeth must be ground and, just before the first heating, thoroughly coated with a talc-saltpeter mixture. The first 6 to 10 welded parts stick fast and must be torn off. Sticking then becomes less frequent and, as the tool becomes rough, it stops.

Every second sheet is also thinly

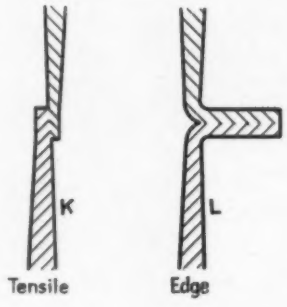


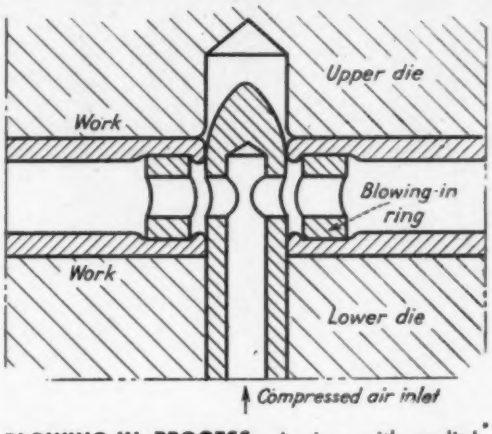
WELDING DIE SETUP—Steel blocks *A* and *B* are heated by gas burners *E* and *F*, which conduct the heat to the dies and their teeth. Water-cooled plates *C* and *D* protect the press against excessive heat. Gas temperature is controlled with chopper-bar regulators and electromagnetic valves, as thermostats have been unsatisfactory. The ram presses the die plates *G* and *H* together, the welding teeth reach a temperature between 420 and 480°C and at lower dead-center pressure reaches 6400 psi, which is minimum for best results



The tooth shape shown is suitable for aluminum sheets between 0.2 and 0.4 mm. thick. Broader teeth are recommended for thicker sheets

At the right is a normal tensile piece *K*, showing the strength which results from the reduced cross-section. In the type of stress shown in the edge-test piece *L*, the welded piece fractures behind the curvature at various distances from the weld seam. This is the type of stress most frequently encountered





BLOWING-IN PROCESS—A ring with radial grooves, inserted between the sheets in previously formed depressions, enables compressed air to be blown in. The ring should be deep enough to locate flush with the sheet on the two halves of the die. A pin at one point in the die controls the air valve. Compressed air is blown in and exhausted through a press-operated valve

HOW TO PRESSURE-WELD HOLLOW PARTS

(continued)

smeared with a 2/1 mixture of talc and saltpeter, mixed with water and washed immediately after welding to prevent corrosion. The saltpeter, melting at about 300°C., causes a slight dampness of the die and enough salt and talc sticks to the welding tooth in the die for one part to be welded without an application of lubricant.

Thorough cleaning and removal of grease from the sheet is essential to good pressure-welding. A pickling bath is the best method and includes a ½-min. dip in 15-20% nitric acid at room temperature, rinsing in water, a ½-min. dip in 15-20% caustic soda no hotter than 50-60° C, rinsing in water and finally dripping in 15-20% nitric acid at room temperature and rinsing in water.

Pickling in caustic soda without previous acid treatment, or after alkaline degreasing, is not sufficiently uniform. Sheet dried in a gas-heated furnace shows faulty spots as the surface is attacked by fatty acids from the gas. An electrically heated furnace provide most satisfactory drying. After drying, the sheets are brushed on the welding side with a roller brush.

Every finger print means a faulty spot. According to the diet of the person in question, the finger print is acid or alkaline. A chemical compound is then formed which can only be removed by grinding or brushing with a wire brush, and not by wiping. Cleaning the sheets by etching alone is inadvisable since, in drying, the water running off collects metallic salts at the last point to dry—usually called "water spots."

Cheapest proved solution on a large scale is to etch the sheet before the last rolling pass in the rolling mill, finish with polished rolls and brush just before pressure-welding begins.

Specifications for the tightness of fabricated cooler elements are particularly severe. They are tested under water between supporting walls with compressed air at 21.3 psi., and without supporting walls at 2.13 psi. Rejections usually amount to 3 to 5%, even with excellent sheet surfaces, which is a common value for deep-drawn sheet parts.

If a weld seam is not tight in the pressure test, inspection is made to see if the leak is near the weld or whether the sheets gape apart where they should be welded. Should this be the case the seam is opened up to find the length of the damage. Dirt on the inside, which was either on the sheet or came in with the compressed air in blowing in, is usually found to be the reason. If this test fails thickness of the welding seam is tested. Excessive thickness or lack of deformation causes faulty welds and gaping seams in the assembly.

Incorrect temperature is one of the causes of excessive thickness and is corrected by subsequent adjustment. Another is slow heating, which can be remedied by adjusting the packing material. In unusual causes slow heating is caused by excessively wide teeth. This causes such a high local increase in pressure that elastic deformation occurs in the tool. In this case the die must be touched up and any local damage in the welding tooth removed.

Faults in the weld seam at the margin nearly always run back from the flange of the margin. Pick-up gives too small a wall thickness and weakens the material by a reduction of section. Faults near weld seams free from cracks occur in the inner weld seams because of excessive blowing-in pressure, too great a depth of groove or through lack of tooth alignment. The element should be cut and the section examined. If the groove is too deep or the teeth out of alignment the dies should be adjusted.

It is implied that the material is free from cracks, but this is not always true. The best guard against rejects is, after adjustment of press and tool, to have a continuous production in which welding follows 5 to 6 min. after removal of the sheet from the roll, followed immediately by stamping and flanging of the edge and pressure testing.

Save Your Depreciation Reserve

BY H. ARNOLD STRANGMAN, TAX ACCOUNTANT

Maintaining reserve in cash is possible by adequate planning

EVERY now and then, a small firm is shocked to find it does not have the cash available to replace old machines, even though its books show a depreciation reserve for the full amount. In such cases, the cash which should have been available for depreciation had been used in some other way, such as to improve plant, increase inventory, or by following a too-generous dividend policy. Such firms make the sometimes fatal error of limiting their concern over depreciation to setting up a reserve for that purpose, and assuming that that will assure their having adequate liquid funds to replace old machines when the time comes.

Because many small businesses always "sail close to the wind" financially speaking, a Machine Replacement Fund might well prove a financial life-saver. Briefly, this consists of nothing more complicated than creating out of earnings, and building up year by year, a reserve in cash for the sole purpose of buying a new machine when the old one is worn out. It is a transaction entirely separate and distinct from that of writing off the cost of the original machine by annual charges to depreciation expense.

Here's How It Works

If it should be estimated that a fund of $5,000 will be required in ten years' time, an annual contribution of $500 is indicated, or $250 each six months. This amount would be necessary for the replacement fund if no account were taken of interest accumulated thereon.

Assuming that semi-annual contributions are to be made to this fund, and interest is to be earned at 2% per annum, compounded semi-annually, the actual amount needed for this fund semi-annually would be $227.07. In ten years this would yield, with interest, $5,000. Annuity tables are available to give you the figure necessary to set up any desired amount on any number of machines.

Contributions to the fund at this rate would be made every six months by check drawn on the regular bank account for deposit in a special savings account designated, "Machine Replacement Fund." Shown in journal form, the entry on the record is:

	DR	CR
Machine Replacement Fund		
Savings Bank Account	$227.07	
Cash		$227.07

Semi-Annual contribution to Machine Replacement Fund

The following entry would be made to establish, and build up, the Reserve for Machine Replacement:

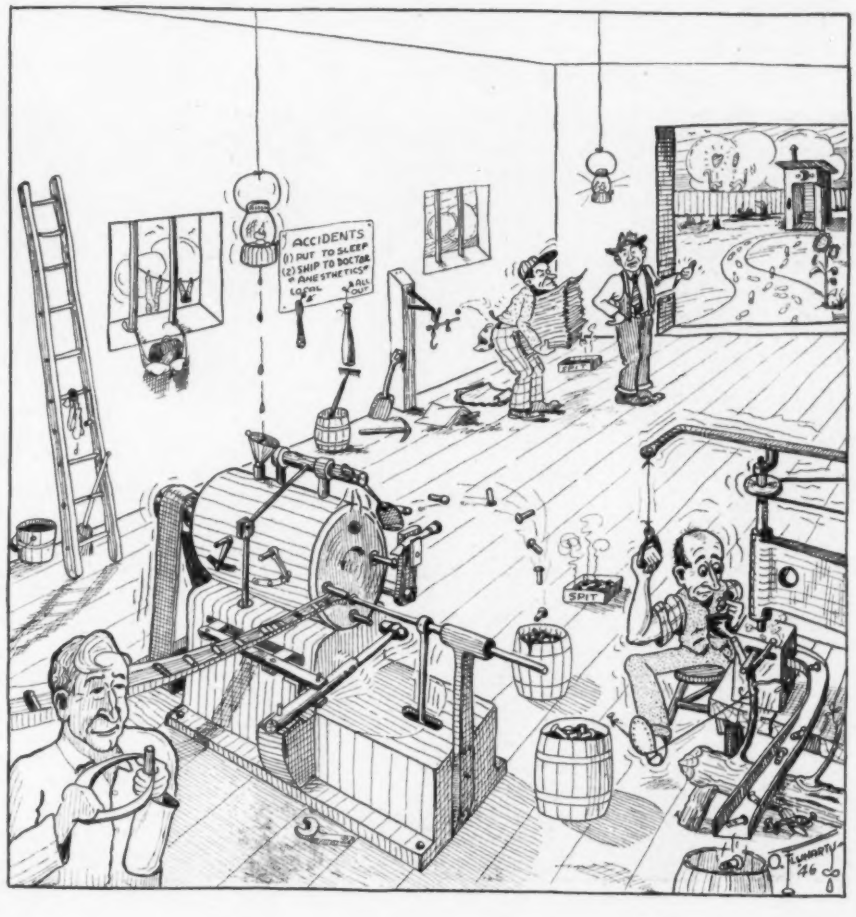
	DR	CR
Surplus	$227.07	
Reserve for Machine Replacement		$227.07

By deducting this item regularly from surplus, the danger of paying excessive dividends without allowing for the depreciation is eliminated.

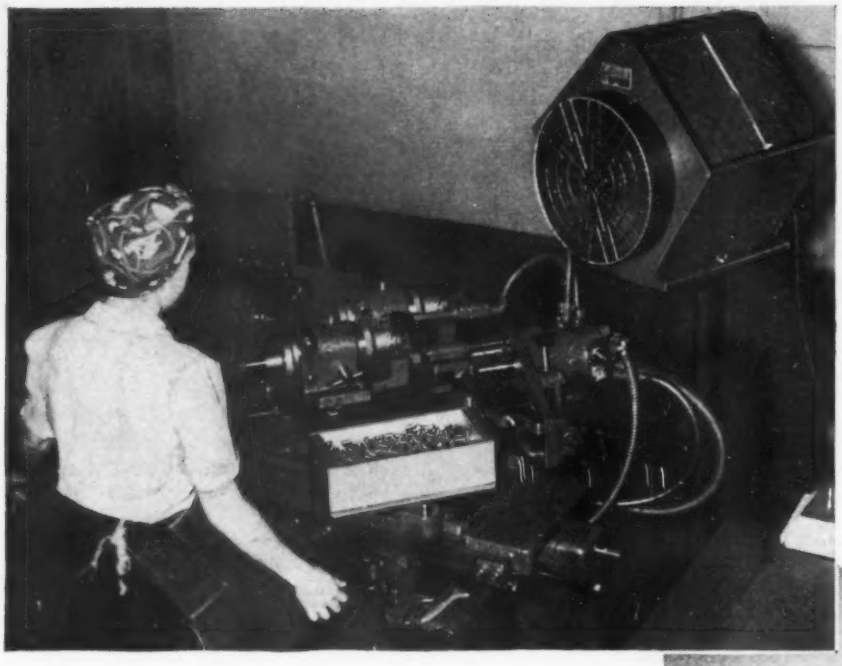
While there are several other ways this accounting can be set up, it should be remembered that the amounts involved must be excluded from earnings calculations for income-tax purposes. The reason is that such calculations have already allowed for depreciation, and the inclusion of the Machine Replacement Fund figure would amount to a duplication.

As the cash funds set aside into this item may sometimes come in handy for the small concern, it is always possible in an emergency to transfer money out of the Machine Replacement Fund bank account into the regular bank account. However, such borrowings should be put back as soon as possible, or else the purpose for which the fund was established will be defeated.

OUR SHOP . . . 11 — *Clevis-pin Department*



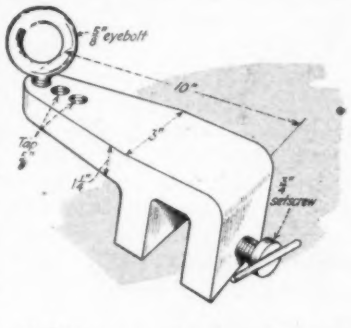
SHOP



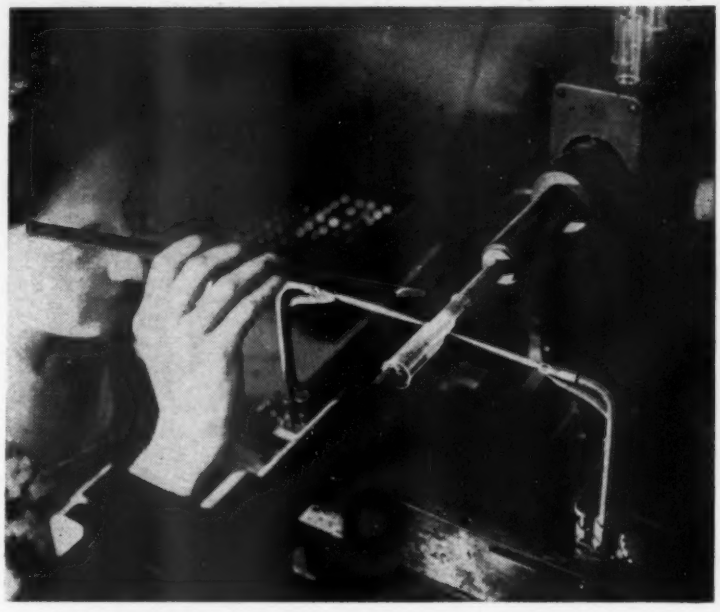
OIL MIST, rising from a 2-head internal grinder during rough- and finish-turning of regulator valve points, covered work benches, gages and floors and created danger. This condition was eliminated by placing a No. 2 Filtaire combination fan and Fiberglas filter unit at the rear of the machine. The exhaust, 3½ ft. above the floor, sucks in air from above the machine to remove all objectionable oil vapor arising from flooded work stations. *Grove Regulator Company.*

PRELIMINARY INFRA-RED HEATING has reduced paint drying processes on truck wheels from one hr. to 20 min. A battery of lamps flanks the wheel conveyor as it begins ascent to the 2nd-floor paint drying ovens. The installation is now so compact that spray booths and ovens can be located on the assembly line where wheels are fitted to the chassis. *Studebaker Corp.*

HEAVY BUSHINGS are lifted readily with overhead hoists by a steel lifting clamp. Body of the clamp is burned from a piece of steel and fitted with an eyebolt for connection to the hoist hook. A setscrew in one of the clamp jaws provides adjustment for handling different wall thicknesses. Weight of the piece holds the clamp in place. Several holes are drilled and tapped in the leg of the clamp so the eyebolt can be positioned to suit the diameter of the bushing and provide balance. *Erie Railroad Company.*



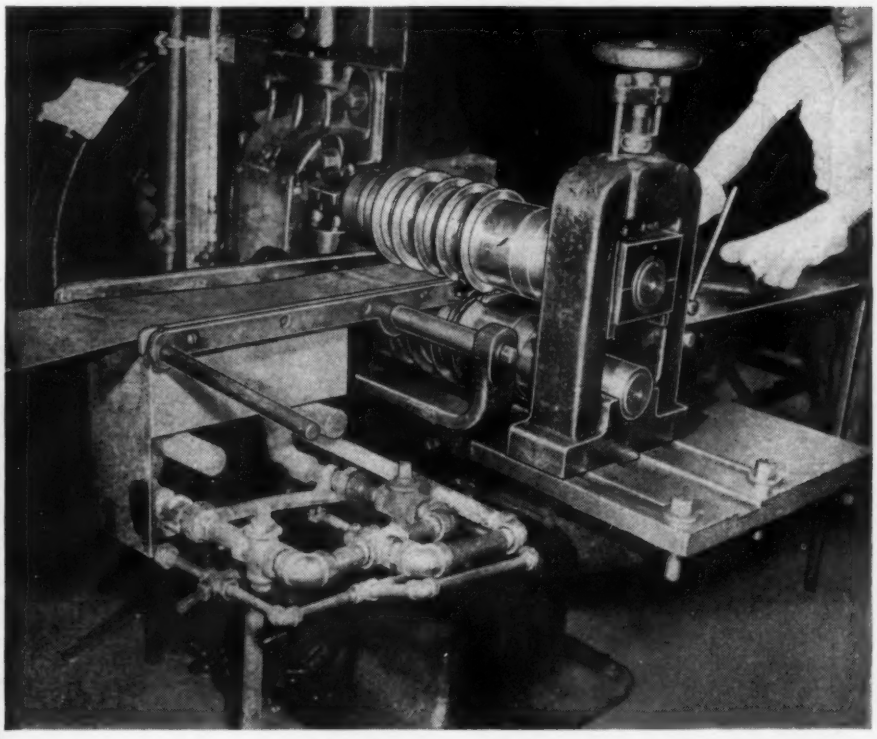
SHOTS



GLASS-TO-COPPER SEALS for transmitting tubes require a high degree of operator skill and must be gaged visually. A special lathe, designed to permit spinning glass onto the copper anode at the right point, eliminated possibility of error and leak-producing oxidation. *Amperex Electronic Corp.*

SMALL PARTS ARE SOLDERED readily by the use of two carbon electrodes mounted in a Micarta panel. The electrodes are mounted at an angle so they can be bridged by small parts such as this copper-strip terminal. A rheostat, mounted under the bench, regulates current. *Mansfield Plant, Westinghouse Electric Corp.*

GLOVELESS HANDLING of electrical tools such as this fuse puller and tester is provided by a transparent plastic housing. As the Tenite plastic is low in heat conductivity, the housing remains comfortable to bare hands in heat or cold. It will not shatter if dropped to cement floors. *Tennessee Eastman Corp.*



BREAKAGE IS ELIMINATED when slitting silicon steel by locating a gas burner on the slitting machine. The burner is attached to the front of the machine, connected to air and gas lines, and steel is fed over it at the correct working temperature. *C. Choquette, Westinghouse Electric Corporation.*

ROUND TABLE

Should A Man Own His Own Tools?

"Ed, I hear Henry Marks is in a huff because I made cracks about that 20-year-old mike of his. As I remember, he said it was better than any so-and-so new mike he'd ever seen, and I said something to the effect that it might be better made, but I doubted if it was more accurate than a newer tool. What's there in that to get steamed up about?"

"Plenty, Al. You tramped on his pet corn. Henry believes any good mechanic should have and use his own tools—and he thought you were carrying the torch for this new-fangled idea of having the company supply everything."

"Well, what's wrong with that idea? If a company expects a machinist to do a certain kind and standard of work, the company ought to supply the tools to do the job. Why should a toolmaker have to own a sine bar and a combination square and a vernier caliper just to prove he can work to close tolerances?"

"There you go again, Al, kicking a long-established idea in the teeth. Tool and die makers have always been expected to provide their own tools—most good ones won't work with any others. Of course, those lugs who work for you are really just machine operators who scarcely know how to use good tools anyhow, so the company provides 'em durable enough to stand the hammering—and then can check 'em regularly to see that those hammer mechanics don't louse 'em up."

"Can the heavy sarcasm, Ed. Let's leave production gages and tools out of it. I think that, even in your fancy-pants toolroom, the company ought to provide all tools and insist that they're used. Then they wouldn't get variation or scrap because somebody's personal tools were on the fritz."

"Listen, Al, the easiest thing in the world is to blame a company tool when things go wrong, and you know it. Besides, there's no incentive to keep 'em or treat 'em right—no pride of ownership either."

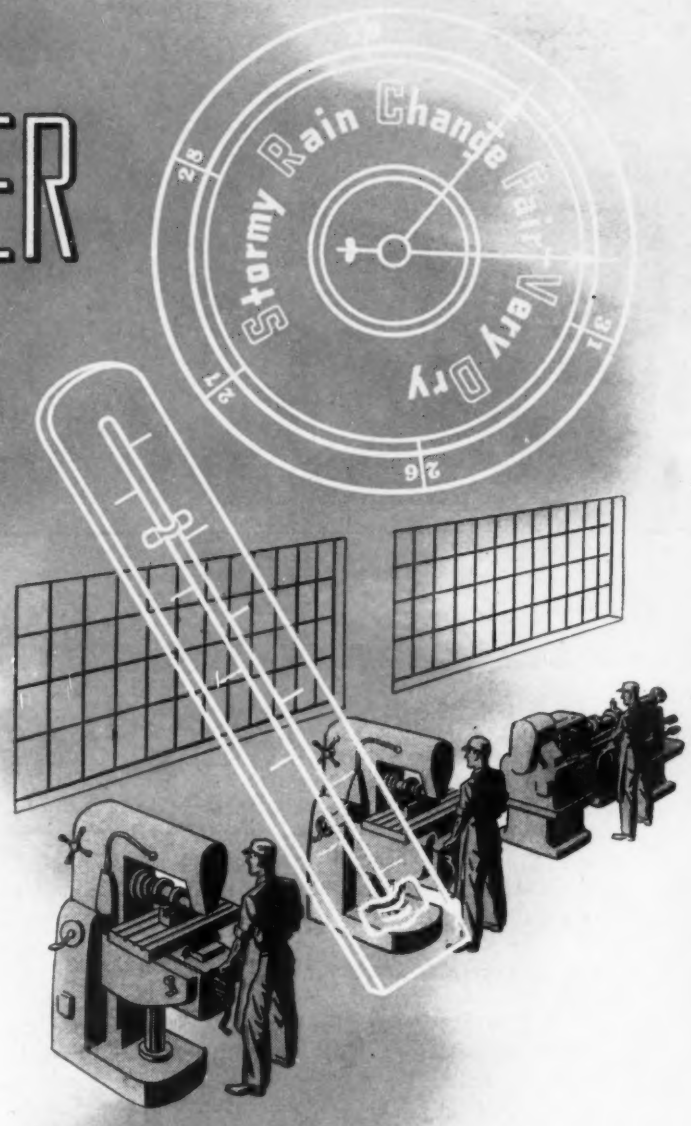
"All I know about it is that the big companies provide needed tools—and avoid alibis that are handed out because somebody used a worn personal tool. The little outfits of course work on a shoestring anyhow and have to avoid investment by getting a guy to buy his own tools. They hand you a hammer, a cold chisel and a file brush, and say that if you want any fancier tools you'll have to provide them yourself."

"I still maintain that if a guy owns his own tools, he's a lot more careful how they're used. Why, if this outfit started to provide adjustable open-end wrenches or small mikes, they'd be stolen out of 'em in a week anyhow."

"Look, Ed, I'll go along on stuff that looks like it would fit the family car—unless the job particularly requires it. Then charging it to a specific man would make him responsible for it—particularly if he knew he'd pay full price for it if it got lost. And I still believe that the outfit that doesn't supply all tools is getting away with something."

***IN A SURVEY** just before the war, 16% of plants had no sine bars, 6% no mikes above 6-in. Some 71% provided some or all small tools, but 84% said men were using some—or all—their own tools. Who should own hand and precision small tools? Your ideas and experiences with this problem will help others. Discussions of earlier topics appear on later pages.*

MAN-MADE WEATHER FOR METALWORKING



BY E. J. TANGERMAN
MANAGING EDITOR

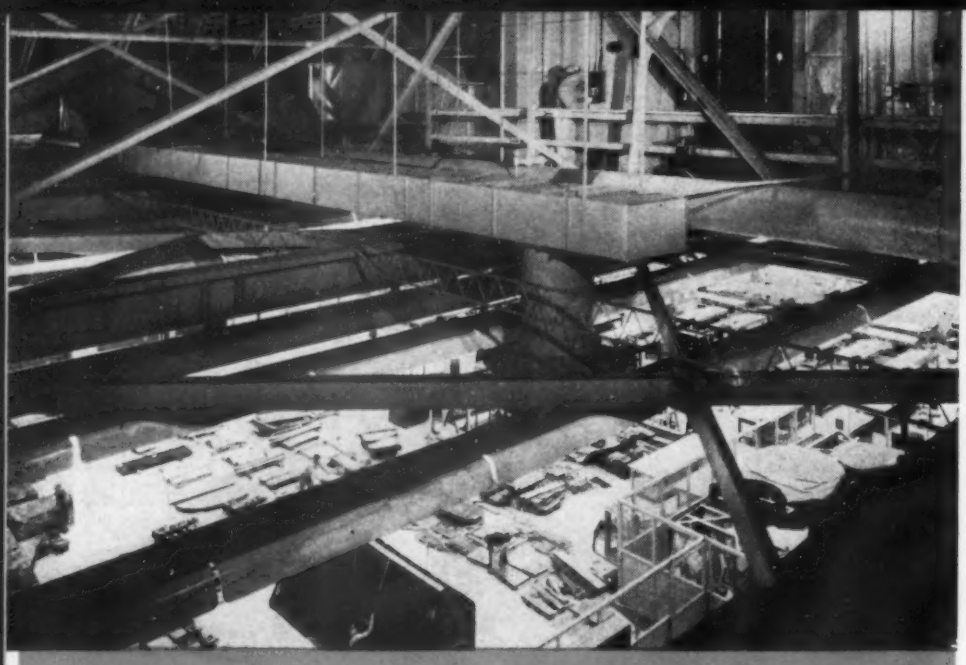
EVERYBODY talks about the weather, but nobody does anything about it," a familiar epigram, has never been true. Even animals and primitive man found shelter from the rain, cooled themselves with water in summer heat, found warmer ranges in winter.

This process of adaptation through the centuries has affected the way we look, the height to which we grow, our customs, our energies and our accomplishments. Inventors, scientists, writers, artists and musicians are products of the temperate zones of the earth, because in these zones temperature and humidity are favorable to creative thinking most of the time. In tropic zones, fatigue from excessive heat and humidity forces noonday siestas and a generally slower tempo; in arctic zones, excessive cold forces a stunted nomadic existence.

Fatigue comes sooner and more relentlessly when temperature and humidity vary from the norm of comfort. Product and machine dimensions and conditions likewise vary enough in these days of close tolerances to cause serious trouble. So metalworking executives the country over have installed, or are considering, control of the atmosphere within their plants.

What is air conditioning?
What does it cost?
Can it improve processes?
Will it raise output per worker?

These and other questions about controlling atmosphere in shop and office are answered in subsequent pages



Air-conditioning outlets extend downward from ducts suspended in the trusses at the Oklahoma City windowless plant. Air-conditioning units are on trusses (right) and joined by catwalks

Fundamentals

WHEN most people think of air conditioning, they visualize its use in a theatre, a restaurant, a department store, or some other place of public assembly. Their experience has been with air conditioning for comfort, and they know how it feels.

Comfort is also important to industry because it enables people to work better, as well as to relax with greater ease. Air conditioning in the metalworking plant has two separate functions: (1) to increase worker efficiency, and (2) to improve the product.

In fact, the first applications of air conditioning were made in industrial plants for their effect on the quality of the product. Just after the turn of the century, Dr. Willis H. Carrier and his associates installed air conditioning in a Brooklyn lithographing plant. Two years later humidity control in a cotton mill was undertaken. Silks, celluloids, pharmaceuticals and rayons became the subject of successful air-conditioning application.

Industrial plants in World War I profited through the use of the new science. The great Atlas ammonium nitrate plant was air conditioned. In the same year, 1917, the first aircraft plant was controlled to make possible the mass production of wooden airframes.

It was not until the early 20's, some 20 years after the founding of the industry, that theatres and department stores began to use air-conditioning. Thus we see that the science of manufactured weather had its origin in industrial application; no doubt a great share of its future lies there, too.

During the quarter century between world wars, increasing numbers of air-conditioning installations were made in metalworking plants, in offices, engineering departments, gage rooms, precision-assembly rooms and other limited areas. Introduction of the windowless factory building in the thirties suggested complete-plant air-conditioning, but not until World War II did such installations become common. "Blackout" plants, war production demands and closer tolerances combined to give air conditioning in metalworking a real impetus.

Air conditioning is the supplying or maintaining in an enclosure of an atmosphere having a composition, temperature, humidity and motion which will produce the desired effect upon people or upon materials stored or processed in the enclosure.

Composition, temperature, humidity or motion may be controlled, without attention to the others, or any two or three may be, for reasons of process or economy. While loosely so designated, this is not air conditioning, but atmosphere control.

The windowless plant, ancestor of the "blackout" plant of World War II and of underground plants which may be forced upon us, permits coordinated design of structure, lighting and air conditioning which is frequently called "controlled conditions." Such a plant is independent of sun, season or weather and is readily concealable in time of war (the North American bomber plant near Dallas, Texas, for example, has an 18-hole golf course on top).

Actually, of course, air conditioning is simply a balanced composite of older and more familiar processes. It involves air movement (ventilation) and air cleaning, both summer and winter, plus heating and humidification in winter and cooling and dehumidification in summer. Thus fans, filters, heating coils, humidifiers, refrigerating compressors and dehumidifiers and integrated controls are the major equipment required.

In metalworking, primary advantages and initial applications of air conditioning were both for advantages in processing. For example, a steel part machined to 36 in. plus 0.002 minus 0.000 in a cold winter shop at 55 F. will gain 0.0047 in reaching a summer temperature of 95 F.—twice permitted tolerances. Aluminum expands even more, a 30° temperature rise causing a 3-ft. aluminum bar to lengthen 0.014 in., a bronze one two-thirds that. Thus a uniform temperature is essential to maintenance of tolerances.

Process Advantages of Air Conditioning

1. *Closer Tolerance.* Temperature may be held to fractional variation. This suggests its use in gage and standards rooms, laboratories, toolrooms, instrument-calibrating rooms, precision manufacturing, precision assembly. At Allison Engine only 14% of 640 supervisors felt that tolerance standards could be maintained without air conditioning. General opinion was that scrap would be increased 10%.

2. *Protection Against Corrosion.* Atmospheric humidity, which causes rust, corrosion or damage to finish, may be controlled, important in precision machining and assembly. Condensation from the atmosphere is avoided, hence occluded-oxygen corrosion. Air conditioning also reduces or eliminates sweaty hands and their acid or alkaline moisture, which frequently cause damage to finish or complicates processing.

3. *Uniformity.* Regardless of weather, season or time of day, atmospheric conditions can be maintained to tolerances comparable with those in metalworking practice. Thus instruments, jig borers and other precision equipment do not change characteristics; parts, materials and patterns in storage do not deteriorate; production rates are more uniform.

4. *Clean Air.* Dust and injurious gases are removed from the air, avoiding damage to finish in plating, painting, precision grinding and similar operations where process-generated or other fumes and foreign matter cause trouble.

5. *Avoids Static.* Usually more important in textile and chemical plants than in metalworking shops, this characteristic is nevertheless important in some cases. Static electricity on occasion is the cause of difficulties with finish or assembly.

6. *Air Circulation.* Continuous air change speeds drying, avoids fume and moisture concentrations and "hot spots," makes it possible to put heat-treating, forging and other "hot" operations actually in the production line rather than in a nearby separate shop or room, thus saving floorspace.

The closed structure necessary for good air conditioning also results in associated advantages, such as constant lighting and noise control.

Air Conditioning for Comfort

1. *Increases health.* Respiratory diseases resulting from pollens, dusts and allergies, such as hay fever and asthma, are obviously alleviated. Reduced incidence of colds, frequently assumed for air conditioning, is more difficult to prove. For example, only 0.9% of 274 workers queried in one survey believed this, while 3.1% claimed increased colds and rheumatic or similar pains. Experience of Eastman Kodak also shows no particular advantages in this regard. Although 78% of 640 Allison supervisors felt health was improved, the prime complaint against air conditioning (one in four) was colds and sinus troubles attributed to it.

Air conditioning avoids the excessively hot summer days or localized high temperatures which overburden the heart and reduce the ability of the blood stream to produce infection-fighting white blood cells.

2. *Increases efficiency.* In an AMA survey, 94% of executives queried said air conditioning increased employee efficiency, 77% said it increased work done, 93% said it reduced fatigue. At Allison, 80% of 640 supervisors felt efficiency of their 16,000 workers was improved. In one Detroit drafting room, efficiency was increased 51.4% (before, 8,988 work units took 5,008 manhours; after, 10,474 work units took 3,872 manhours; an increase from 1.8 to 2.7 units per manhour.) Eastman Kodak feels efficiency may not be increased, but it certainly would not be cut. For example, a worker at low effort and fixed rate (slow assembly or automatic machine operation) might show little or no improvement, while a worker at a high level of physical effort would feel less fatigue, particularly on hot summer days.

3. *Increases comfort.* This is difficult to evaluate, for a man seated in conference may be most comfortable at 71°, (effective temperature, which might be 78 F. dry bulb at 40% relative humidity) an office worker at 67°, a sweeper at 59°, and a light metal worker at 51°. A rise of 3 F. in temperature may cut number of comfortable workers from 98% to 30%, causing many to slack off, becoming more comfortable but producing less. Air conditioning can maintain comfortable working conditions for more than 90% of the workers continuously, while an ideally designed ventilation system will provide comfort to only about 75% for less than half the summer daytime hours. Thus, air conditioning results in materially increased worker comfort.

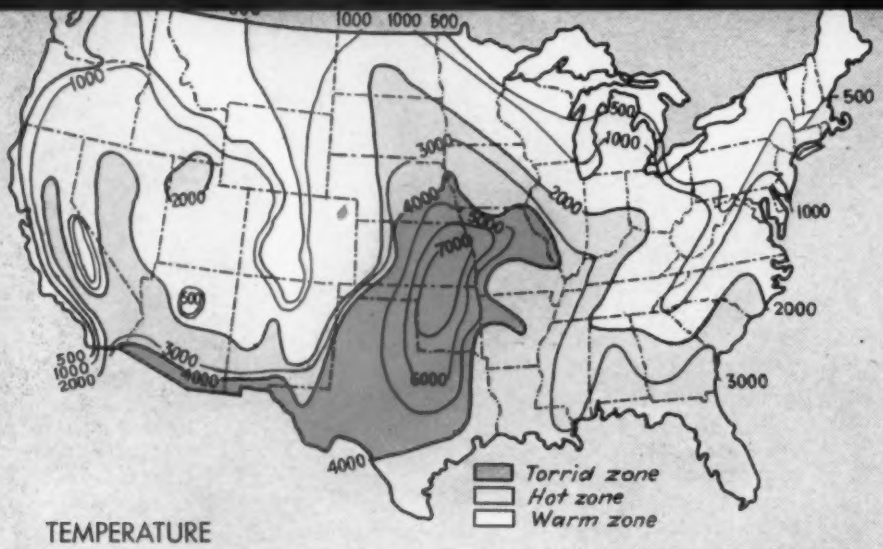
Other Advantages

1. *Reduced Cleaning Costs.* A Detroit firm reports that dust accumulation in air-conditioned spaces was about a fourth that in nonconditioned spaces. This results in a cost of cleaning 43% lower and total operating and maintenance cost 39.7% lower. At Allison Engine, 70% of supervisors felt maintenance costs were reduced through air conditioning. Apparently, where standards are normally high (as in food processing), air conditioning would cut such costs little; where standards are lower, as in Metalworking generally, such costs would be cut considerably. Dust-caused belt-gumming, gear and bearing wear and electrical shortcircuits are avoided as well.

2. *Decreased Absenteeism.* General indications are that absenteeism declines 25 to 30% when air conditioning is installed. While generally attributed to improvement in health, a good deal of it may be psychological, or improvement in morale resulting from such factors as pleasant working conditions in unplesant weather, reduced bodily discomfort and the like. At Allison Engine, 78% of supervisors felt morale was improved, 80% felt jobs were more attractive, 57% felt absenteeism was decreased, 52% felt turnover was decreased, through air conditioning.

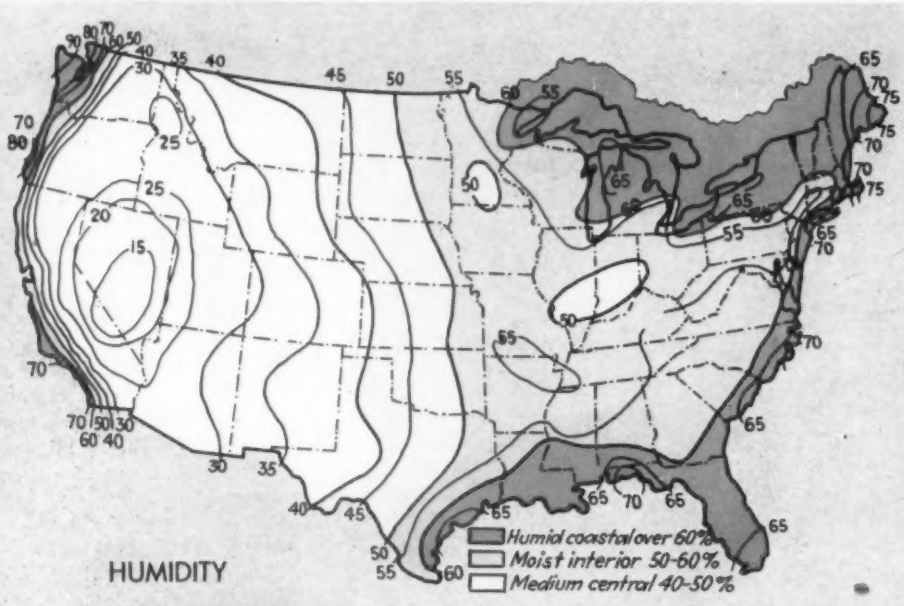
3. *Increased Production.* Some engineers use the rough figure of 10% loss in efficiency as a result of summer heat, 5% loss as a result of winter cold. A N. Y. state commission, studying the problem where

Air-conditioning ducts are above the suspended ceiling in the engineering building of Emerson Electric Mfg. Co. Daylight is admitted through windows normally closed



TEMPERATURE

Length of time in each zone that cooling is required, expressed in deg.-hr. above 85F.



HUMIDITY

Range of relative humidity for July (average noon-day readings)

heavy physical work is involved, found that work accomplished dropped 15% when temperature was raised from 68 to 75 F. with relative humidity held at 50%. If temperature was raised to 86 F. and relative humidity allowed to go up to 80%, production dropped 28%. With temperature and humidity constant, production dropped 9% in stale air (23 to 66 parts CO_2 to 10,000 parts air).

Cost Comparisons

Austin Company compares conventional and "controlled-conditions" buildings of three sizes, as shown in the table (lower right). Controlled-conditions structures are, of course, usually cheaper in first cost than conventional buildings, because costly window framing and roof venting and shaping are eliminated. Solid walls reduce exposure area, insulation is simple, so heating and refrigerating plants can be smaller. Cleaning and painting are reduced, washing and replacing of windows avoided, as well as awnings, curtains and lost area for light shafts and courts.

H. A. Mosher, mechanical engineer for Eastman Kodak, has made similar calculations for a factory building in Rochester, N. Y. The chart (upper right) compares an ideal ventilation system, which provides comfort to 75% of moderately active workers for about half the summer working hours, with an air-conditioning system that provides comfort to over 90% of workers during all working hours (71F. effective temp.). In addition, the air-conditioning system holds dry-bulb temperature within plus or minus 1F., relative humidity plus or minus 3%,

Comparative Costs of Conventional and Controlled-Conditions Plants

(Minimum requirements of controlled lighting, temperature and humidity)

ZONE	TYPICAL CITIES	LENGTH OF SEASON Av. Heating Deg.-Days	Cooling Deg.-Hr. Max.	Min.	COMPARATIVE COSTS Percent Conv.	C.C.
I	Houston	1360	4200	2900		
	Savannah	1650	3540	2300	100	140
	New Orleans	1210	3500	2070		
II	San Diego	1650	20	0		
	Ft. Worth	2350	9200	4400	102	118
	Birmingham	2620	3910	2400		
III	Memphis	3080	4730	2000		
	Cincinnati	5010	3940	1000	106	128
	Washington	4600	1950	1270		
IV	Minneapolis	7990	3020	1150		
	Des Moines	6400	6570	1450	110	127
	Omaha	6100	7820	1940		
V	Chicago	6300	1800	500		
	Cleveland	6170	720	150	108	128
	Buffalo	6950	115	10		
VI	Kansas City	4800	12400	2500		
	Okla. City	3700	11650	4100	105	132
	Little Rock	3000	4600	2000		

Winter heat required per 24 hr. for 70F. buildings is proportional to the no. of deg. the av. outside temp. falls below 65F. Summer deg.-hr. is the av. total of the hourly temp. above 85F. Because of outside and inside factors, which vary widely and often hourly, this is only approximate. Actual geographical location and orientation of the building on the site also affect it.—Austin Company.

BASIC ZONES

Based on the two preceding maps, this

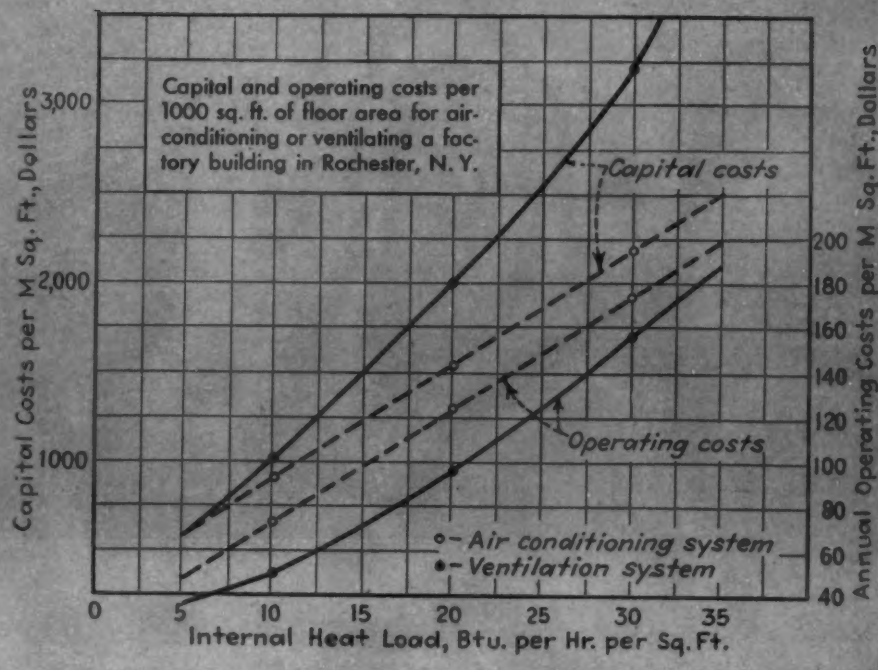
and 98% smoke arrestance. The ventilating system would allow room-temp. variations of 75F. or more, R. H. variation of 15 to 75%.

His study indicates that air conditioning costs less than ventilation whenever internal heat gain is over 5 Btu. per sq. ft. per hr., but operating costs of air conditioning are always higher. At an average internal heat gain of 20 Btu. per hr. per sq. ft., the ventilating system will cost $0.46 more per sq. ft. of floor area, the air conditioning system $0.026 more per year to operate, so 16½ yr. would be required to amortize the less-satisfactory system.

Allison Div., General Motors, spent $1,120,000 to condition a 1-million sq. ft. area, or $1.12 per sq. ft. Conditioning equipment cost $250 per ton. Of total cost, 20% was for refrigeration, 29% for air-handling systems, 20.4% for sheet metal, 5.85% for temperature control, 4.5% for heat exchangers, cooling towers and circulating pumps, 6.85% for water and steam systems, 2.15% for pipe insulation, 0.52% for instrumentation, 0.33% for painting, and 10.4% for installation, supervision, etc.

Cost to be amortized over 20 years was $56,000 per year. Operating cost for the first year was $311,576, of which 13% was labor, 17% power for fans, 3% condenser water, 13% compressor power, 28% steam cost, 2% water-pumping cost, 24% depreciation. Operating cost is thus roughly $0.30 per sq. ft. per year, $36.70 per operating hour, and $0.013 cents per hr. per employee per shift (3,000 employees, 2 shifts). Tight structure and elimination of glass exposure also cut heating 15%, not allowed for here.

one depicts zones in which costs compare



CONVENTIONAL vs. CONTROLLED-CONDITIONS

Item	Compact Plant[1] Conv.	Compact Plant[1] C.C.	Medium Plant[2] Conv.	Medium Plant[2] C.C.	Open Plant[3] Conv.	Open Plant[3] C.C.
CONSTRUCTION COSTS						
Superstructure	63%	62%	67%	65%	57%	54%
Plumbing, Drainage	6	5	5	5	5	5
Htg. & Vtlg. or Air Cond.	6	17	5	16	13	22
Lighting	10	10	11	11	9	10
Power Wiring	3	3	1	1	4	5
Sprinkler	3	3	5	5	0	0
Boiler & Cooling Plant	9	21	6	15	12	20
TOTAL	100%	121%	100%	118%	100%	116%
ANNUAL COSTS per SQ. FT.						
Fixed Charges[4]	$0.34	$0.44	$0.27	$0.39	$0.81	$0.97
Maintenance, Structure	.05	.02	.06	.02	.04	.01
Operation of System	.23	.38	.08	.15	.04	.11
Electric Lighting	.09	.09	.07	.08	.19	21
TOTAL	$0.71	$0.93	$0.48	$0.64	$1.08	$1.30
Per Manhour, Two Shifts	2.1¢	2.7¢	1.3¢	1.7¢	1.2¢	1.5¢

Note 1—A 1941 New Jersey plant, with high concentration of machinery and employees, with manufacturing area of 306,000 sq. ft., and two 8-hr. shifts of 2,500 men for 275 working days, with controlled-conditions plant to same area and height, assuming 285,000 sq. ft. air-conditioned.

Note 2—A 1941 Indiana plant with medium concentration of machinery and employees, with 153,000 sq. ft. manufacturing area and 1,200 employees for 275 annual working days.

Note 3—A 1942 Okla. controlled conditions plant with low concentration of machinery and employees, with 1,585,000 sq. ft. manufacturing area and 25,000 employees for 275 working days. Conventional plant of same size.

Note 4—Fixed charges based upon 6% for interest on capital investment and depreciation apportioned on 10, 15 and 20 years of life of air-conditioning equipment, boiler plant and building respectively.—*Austin Co.*

Even blast-air supply at machines is refrigerated to remove moisture at the Lukas-Harold plant in Indianapolis. Conditioned-airoutlets are flush with the ceiling, as are troffer fixtures

Typical Plants

A PRACTICAL way to study potentials for air conditioning in any plant is to check similar plants that have been so equipped.

Simonds Saw and Steel, Fitchburg, Mass., Woodward Governor, Rockford, Ill., and Grumman Aircraft, Bethpage, N. Y., for example, have windowless plants with well water as the principal coolant. Simonds, first controlled-conditions plant, was begun in 1931, but not completed until 1938. It has double walls, with an air space between outer masonry and interior acoustic block, and a metal acoustic ceiling insulated with cork and topped with asphalt paper, two layers of ½-in. roof insulation, then layers of asphalt and built-up roofing. At Grumman, refrigeration load is reduced by spraying spent water from the system on the roof to supplement insulation. At Woodward it has been found that cooling is required in office areas at temperatures down to 3F. below zero and in shop areas down to —45F. (unless the plant is inoperative) because of building tightness.

Among the largest air-conditioned metalworking plants are the tremendous bomber-assembly units at Fort Worth, Tulsa, and Oklahoma City. All three have central refrigerating systems from which chilled water is delivered to individual conditioning units throughout the plant. The same piping carries heating steam in winter. Fort Worth and Tulsa are 320 ft. wide, 4,000 ft. long, and average 65 ft. high. with a cubage of 75 million, requiring 7,000 tons of refrigeration. As some indication of relative size, either plant is the equivalent of 33 super-theatres seating of 213,000 people.

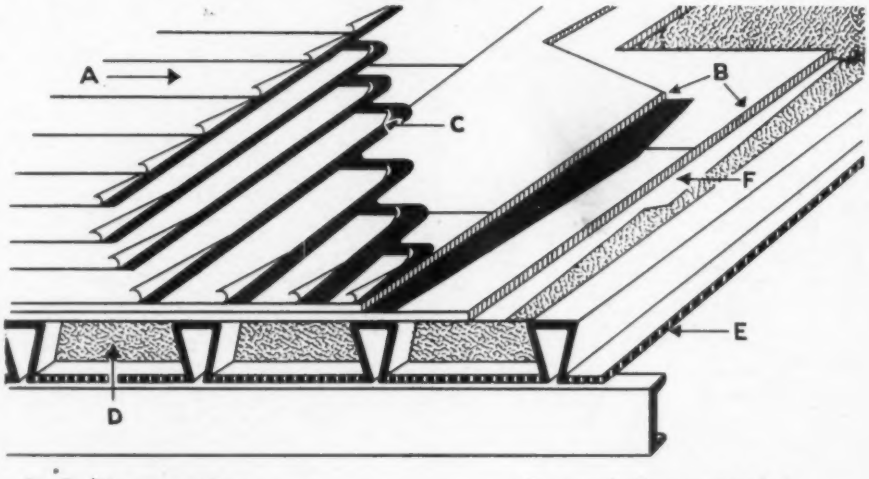
Experience with the Simonds double wall and the insulated porcelain-enameled steel walls at Armco Research Laboratories, Middletown, O., led to several unusual industrial wall designs, the most unusual being in these same huge bomber plants. Fort Worth and Tulsa have 6-in. walls and 5-in. roofs of steel and Fiberglas. Walls and ceilings were planned to combine light weight and high insulating value with resistance to high winds and shock from possible bombing. Wall weight 10 lb. per sq. ft., thermal coefficient 0.07 Btu., ceiling weight 11 lb. per sq. ft., thermal coefficient below 0.06. Long-span formed-metal sections with Fiberglas mats and large insulating board speeded erection, gave high light reflectance and 75% noise absorption.

Oklahoma City has a steel-saving masonry wall 50 ft. high which incorporates a vapor seal between inner masonry and the 4-in. rockwool insulation.

Two Midwestern plants, Woodward Governor at Rockford, Ill., and Lukas-Harold at Indianapolis, Ind., are among the most carefully planned of controlled-conditions plants. In both cases, maximum attention was given to lighting, color, employee comfort and process efficiency. The latter is equipped with a number of relatively small self-contained refrigerating units.

General Electric combined full control and part control of conditions in its new Tiffin, O., fractional-horsepower motor plant. About 25% of the area (40,000 sq. ft.) is the final assembly, completely airconditioned (200 tons of refrigeration). The rest is ventilated by fans and roof exhausts to obtain 22 changes of air per hr. Continuous fluorescent troffer lighting at 15 ft. supplies 43 fcdles. at the working plane, and all power, services and ductwork are in the trusses overhead.

Special roof and wall construction were used at Simonds Saw, and served as patterns for later plants. Here is the roof structure, showing the cork insulation. Walls are double, with air space between

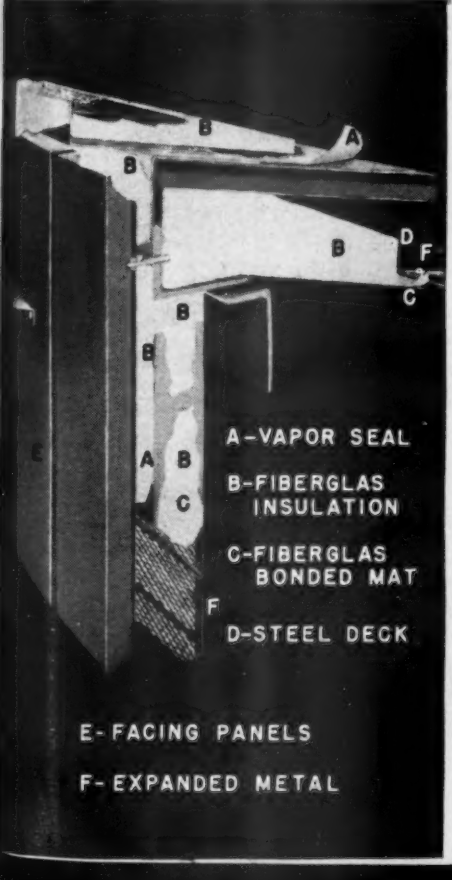


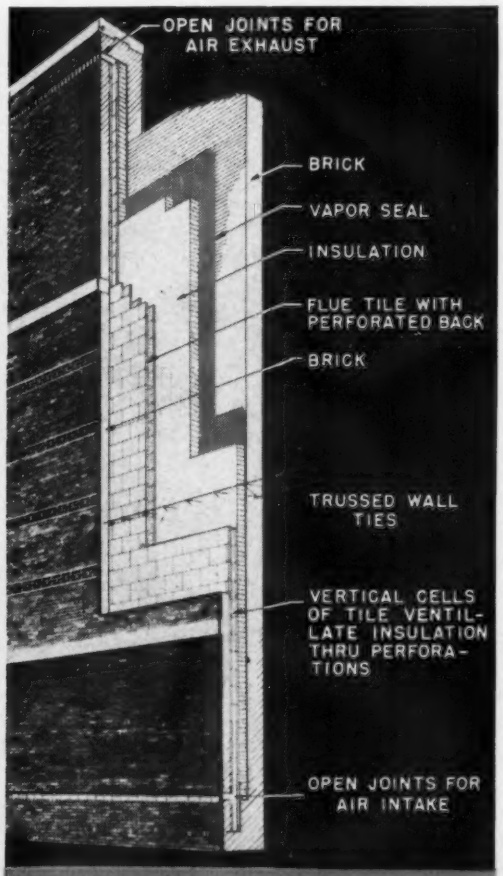
A Built-up roofing
B Two ½" layers of rigid roof insulation
C Asphalt roofing
D Insulating material
E Perforated metal deck
F Asphalt paper

27 TYPICAL WAR-PLANT AIR-CONDITIONING INSTALLATIONS

Plant	Location	Operation	Tons Refrigeration
Douglas Aircraft Corp.	Tulsa, Okla.	Bomber Assy.	7000
Douglas Aircraft Corp.	Oklahoma City, Okla.	Bomber Assy.	7000
Consolidated Aircraft Corp.	Ft. Worth, Texas	Bomber Mfg.	12000
Buick Div., General Motors	Chicago, Ill.	Aircraft Engine Mfg.	535
Delco-Remy Corp.	Anderson, Ind.	Aircraft Engine Mfg.	1000
Douglas Aircraft Corp.	Long Beach, Calif.	Aircraft Assembly	4025
Bendix Westinghouse Auto-Air Brake	Elyria, O.	Aircraft Parts	425
Collins Radio Corp.	Cedar Rapids, Ia.	Acft. Communication	125
North American Aircraft Corp.	Dallas, Texas	Bomber Assembly	2600
North American Aircraft Corp.	Kansas City, Mo.	Bomber Assembly	2600
Cincinnati Milling Machine Co.	Cincinnati, O.	Office & Precision Lab.	400
Packard Motor Co.	Detroit, Mich.	Aircraft Engine Mfg.	1000
Ford Motor Co.	Detroit, Mich.	Aircraft Engine Mfg.	6000
Wright Aeronautical Corp.	Lockland, O.	Aircraft Assembly	6861
Mergenthaler Linotype Company	Brooklyn, N. Y.	Precision Mfg.	25
Studebaker Corp.	Chicago, Ill.	Aircraft Engine Mfg.	8050
Allison Engine Plant	Indianapolis, Ind.	Aircraft Engine Mfg.	2750
SKF Industries	Philadelphia, Pa.	Ball Bearings	75
Kollsman Instrument Company	Elmhurst, N. Y.	Aircraft Instrument Mfg.	22½
Carter Carburetor Co.	St. Louis Mo.	Office & Mfg.	500
General Electric Co.	Tiffin, O.	Frac.-Hp. Motor Mfg.	200+
General Motors Diesel Div.	LaGrange, Ill.	Precision Mfg.	500
Argonaut Realty Div., G. M.	Vandalia, O.	Propeller Mfg.	450
Landis Tool Co.	Waynesboro, Pa.	Toolroom Spindle Assy.	20
Remington Arms Co.	Bridgeport, Conn.	Precision Mfg.	100
Brooklyn Navy Yard	Brooklyn, N. Y.	Precision Assy.	300
Bendix Radio Corp.	Baltimore, Md.	Radio Mfg.	500

High thermal and acoustic properties are combined in the special wall and roof developed for Fort Worth



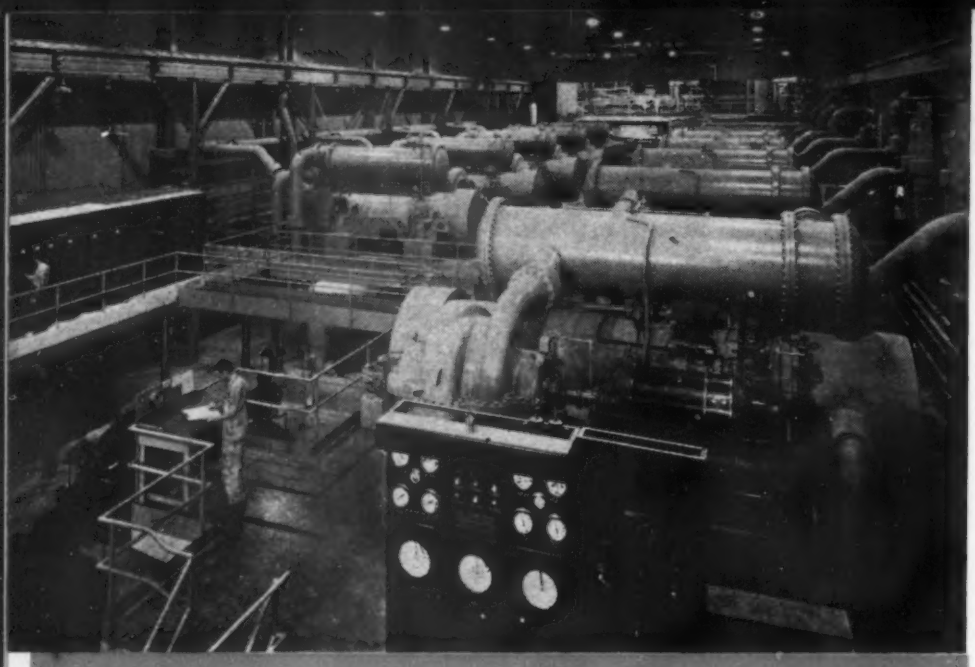


"Breathing" walls of masonry enclose the Oklahoma City bomber plant. Open vertical courses ventilate this wall, equal in insulation to 80 in. of brick

About 10% of the conditioned air is exhausted into the ventilated space through louvers; the rest is recirculated. Special units are installed to maintain higher humidity in the insulating-cotton storage room and in the punch-press room where motor-assembly fabric is cut.

Westinghouse, at East Pittsburgh, has an air-conditioned circuit-breaker assembly room, 60x240 ft. with 16-ft. ceiling, held to 77F. dry-bulb, plus or minus 1F. to permit accurate calibration of the high-precision units. Two 8-cyl. compressors are arranged to cut in whatever number of cylinders is needed to maintain conditions. Winter humidification is provided, but no summer dehumidification, because the process does not require it.

Other plants with various amounts of air conditioning are listed in the table. Unusually small refrigeration tonnages normally indicate area conditioning, although some are simply small plants, like Collins Radio, for example. A sensible approach to an examination of air-conditioning potentials for your plant would be to seek out a similar plant from this list, then find out for yourself what this user's experiences costs and advantages have been.



Eleven 1075-ton turbine-driven centrifugal compressors supply the system at Fort Worth—largest air-conditioned building. Control is centralized at the far end; condensers are under the mezzanine

Systems

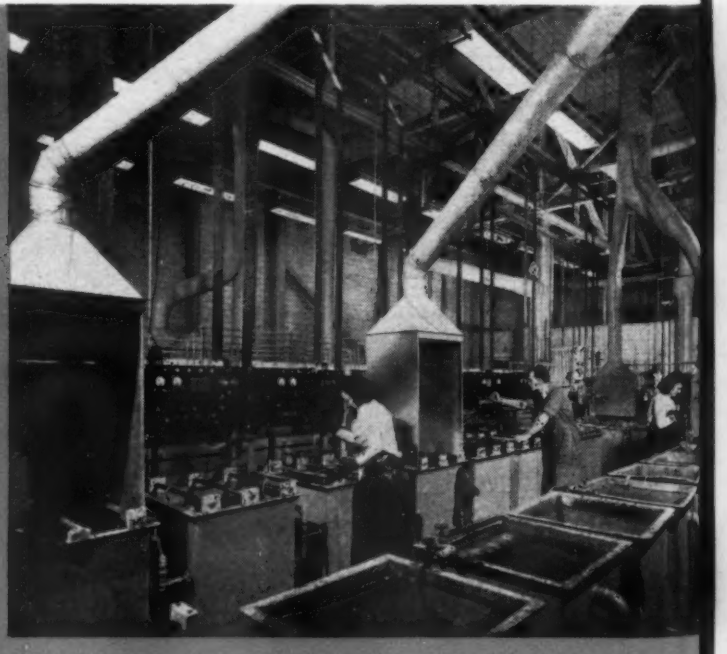
THERE are three major air-conditioning systems: unit conditioners, conditioning units with a central supply of refrigerant or cold water, and central systems. The first are factory-assembled units designed for wall, floor or ceiling mounting in small rooms, laboratories, offices, or in battery where the ductwork for a central system cannot be worked in or other factors prevent use of the latter. There are many variations, some containing only circulating and cooling elements, while others also humidify, heat, filter and dehumidify. Still others, with cooling coils but no refrigerating equipment, are utilized in the second system.

Central Systems — These systems commonly serve large areas through ducts, particularly when ductwork can be designed into new construction. Where processes are complex, heating loads non-uniform, or conventional buildings are being converted, supplementary heaters, humidifiers, coolers and dehumidifiers may be required in certain ducts. These units are separately controlled to compensate for differences in supply and demand.

The central-station system processes and distributes the air from a central point through ducts to all areas which are to be conditioned. It can be used with or without refrigeration. Air-conditioning with refrigeration is independent of outside weather conditions in maintaining proper temperatures and relative humidities. Where a plentiful supply of cold well water is available, this may be used as the cooling medium, being circulated to units just as mechanically cooled water is.

Conventional central systems distribute through ducts above the bottom chord of the roof trusses, with returns at the wall-floor line or at fan units. When large quantities of excess heat and fumes must be removed, considerable high-velocity air may be introduced near

Used air from other departments enters the plating department at Lukas-Harold through doors and large wall openings. Fans exhaust fumes above tanks



Special ducts and vents and metal curtains down 10 to 15 ft. below trusses trap process heat and gases from the cadmium-plating department at Oklahoma City

the floor and allowed to escape through roof ventilators directly above the sources of high heat. In such cases, upper areas are curtained so conditioned air from other areas will not be siphoned out and so the heat-generating equipment may be placed where process demands.

This has been done at Simonds Saw & Steel, where heat produced by 70-odd oil, gas and electric heat-treating furnaces is curtained and exhausted overhead with used air from the air-conditioning system, while furnace gases are carried off through exhaust tunnels under the floor. This arrangement permitted Simonds to make major economies in production, departmental supervision and production controls. A foreman is placed in charge of each of the eight parallel production lines and has full authority for scheduling production to maintain finished-product inventory within certain limits. All raw stock and material in process is open to view as he supervises his line, so process inventories are unnecessary.

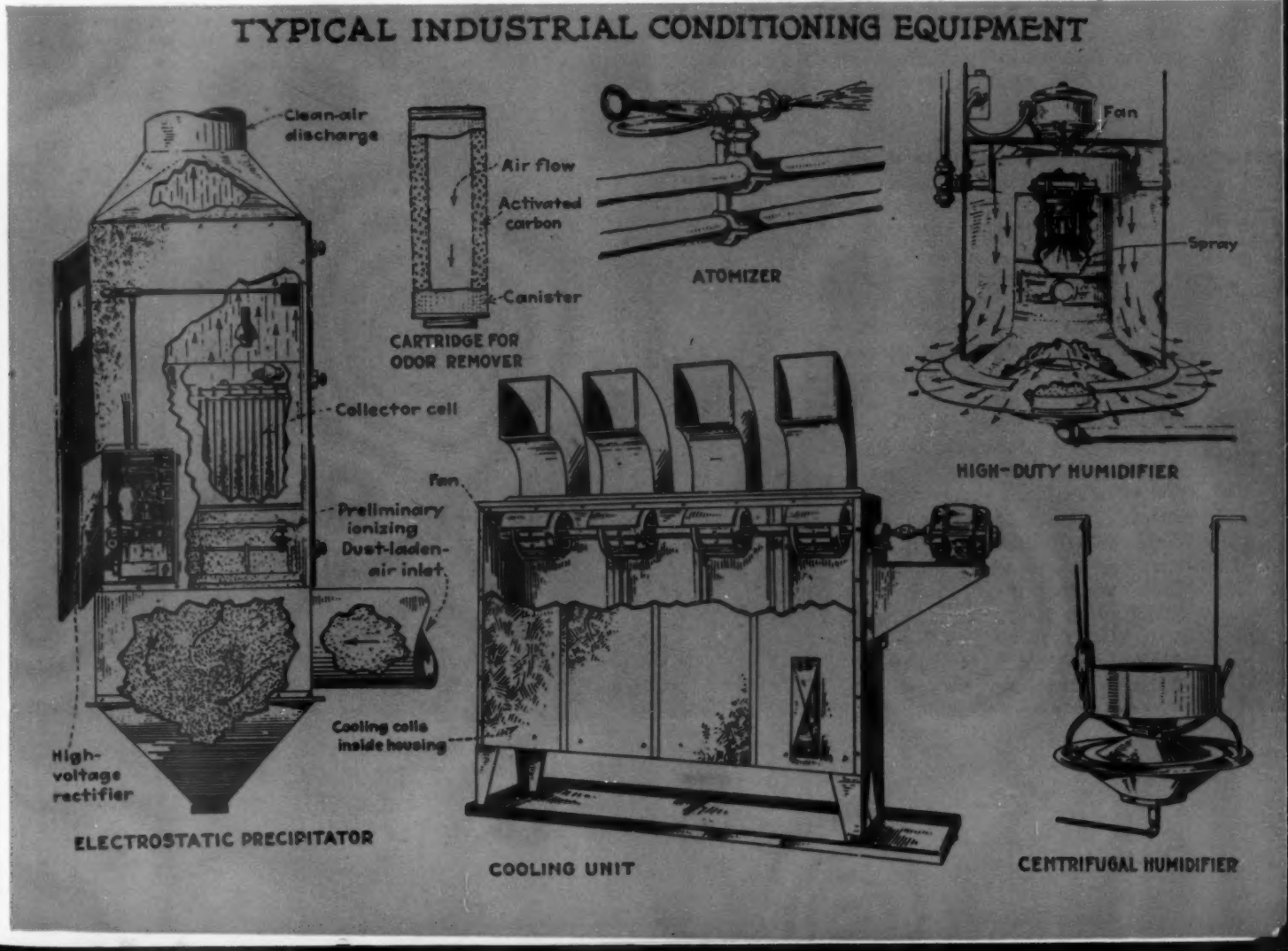
The economic maximum size for an air-conditioning unit is about 100,000 cfm., but preferred practice is to limit each to 40,000 to 65,000. This permits equipment to be placed on mezzanines, raised platforms or in the trusses, thus saving production space. Also, larger ducts are too big to go through trusses, are hard to brace, interfere with lighting and are difficult to balance in air delivery. 400 ft. is considered the maximum sensible duct length.

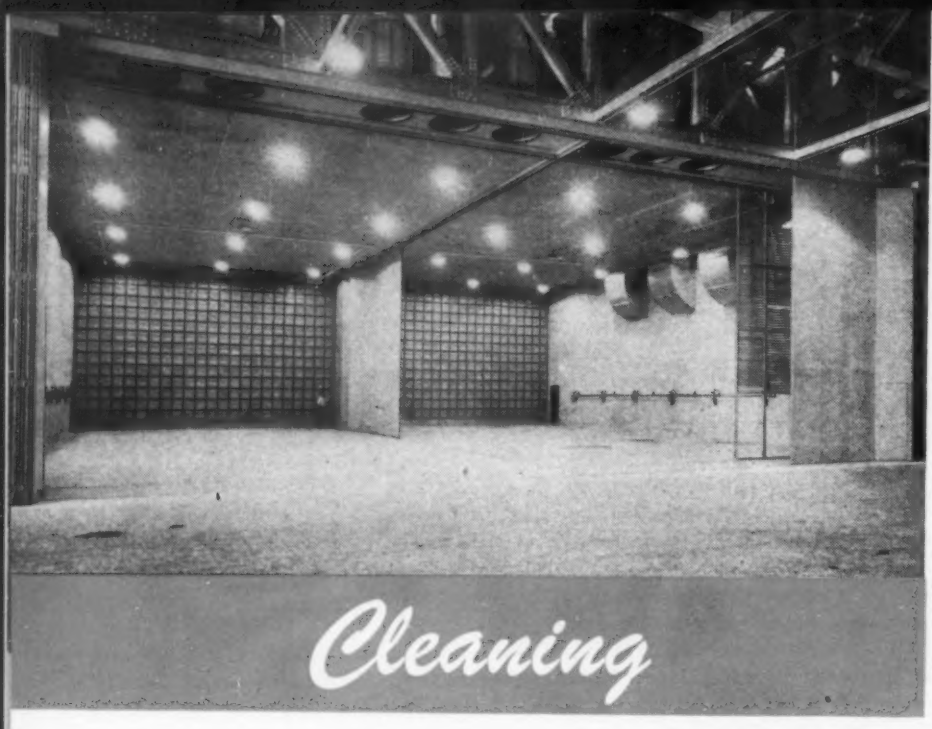
Air-conditioning units at Oklahoma City are above the trusses and reached by catwalks the length of the plant. There, as at Fort Worth and Tulsa, refrigerating units are in a single room with the boilers that provide process, heating and driving steam. Chilled water and steam are piped to the fan rooms, each with its own fresh and return air intakes, filters and combination heating and cooling coils. (In some cases, water and steam may be pumped through the same pipes.) Such an arrangement is flexible for temperature control and requires minimum piping and reciprocating equipment.

• An alternate method is to put motor-driven compressors, complete with evaporative condensers, in each room. Only hot water or steam need then be supplied, so piping costs are low, but wiring casts and duct costs are increased and more maintenance is involved.

Thermal shock experienced by persons passing from a hot, humid outside atmosphere to "cold" desirable effective temperatures of 70 to 71F. inside may be serious. If processes do not require maintenance of the ideal temperature, it is better and more economical to modify to 75 or 80F. dry-bulb in summer. Two alternatives are to provide an intermediate temperature in lobbies or to raise the average temperature of the entire building during shift change.

Paint booths, pickling, plating and anodizing departments must usually have special hoods or curtained overhead areas and special ventilation if they are placed directly along the production line. This prevents spread of vapors through the plant. Two such setups are pictured on the facing page, both for plating departments. Another, for a paint booth, is shown on the next page.





Fiberglas filters across the back of this two-compartment paint room supply clean air which is exhausted through stacks above doors. Louvers in the inner doors direct air upward, relieve pressure on outer doors

Cleaning

PASSING air through a water spray—as in cooling, humidifying and dehumidifying—removes a large part of the entrained dust and dirt. If the spray water is changed frequently, it will also remove most odors. But air-conditioning units and systems usually go beyond the cleaning capacity of a spray—partly in self-protection to avoid clogging or coating of elements.

Filters or precipitators remove dust, fumes, smoke (soot) and bacteria. Odor removers (activated-carbon cartridges) and perfumers (really odor "overcomers") may be added as well.

Dry Filters—Dry fibrous or fabric materials, or porous composition paper is arranged in a labyrinth in a standard-size frame of thin metal, fiber or wood faced with wire or plastic mesh or expanded metal. These packs are set in banks in a frame. Some are discarded when dirty; others are tapped or jarred to shake out dirt; still others washed, blown in reverse or arranged so outer layers can be replaced. These units are primarily suitable for light loadings and fine dusts.

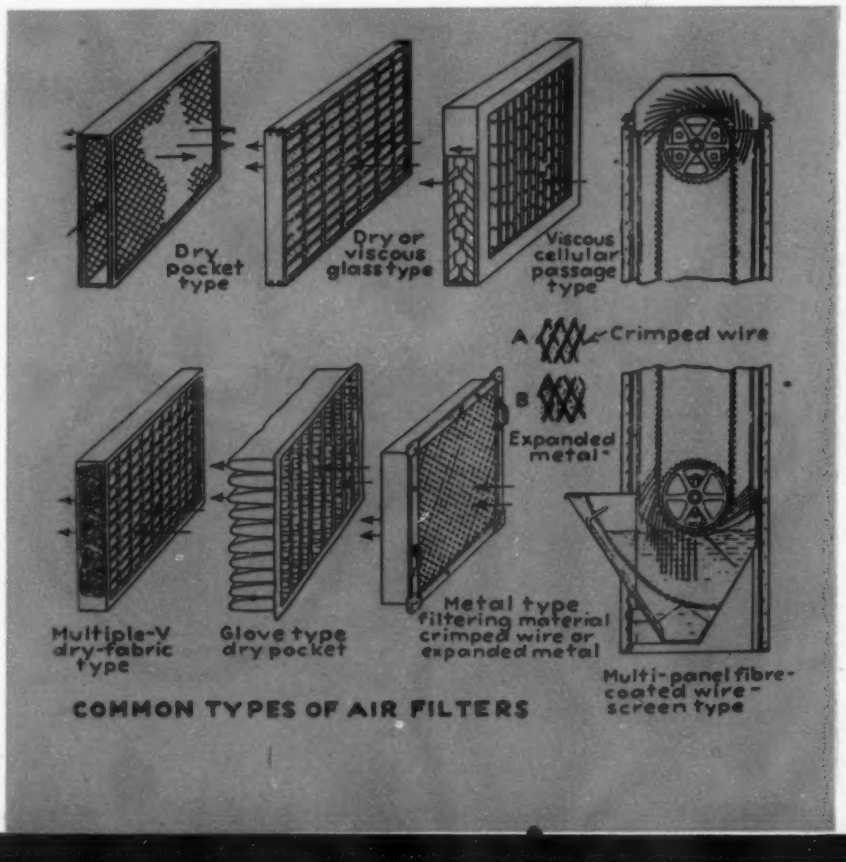
Wet Filters—These elaborate variations of flypaper have glass fiber, steel or other metal wool, hair, vegetable fibers, bias-cut cardboard or similar materials arranged in mats through which the air must pass in fine streams. On every surface is a coating of sticky, viscous oil, so dirt and dust particles are trapped and held as the air passes. Some units may be cleaned by washing with steam or an oil solvent. If lint is present, however, it will quickly clog a viscous filter. These units are suitable for heavy loadings and coarse dusts.

Automatic Filters — These are usually high-capacity types for large volumes and long-hour use. They consist of an endless chain or belt of plates or filter material running vertically over sprockets and dipping into a tank of viscous oil at the bottom. Air passes the belt horizontally, so dirt particles are trapped and carried down into the tank, where the surfaces are washed and recoated. Such units are expensive, and are used where 50,000 cfm. or more must be cleaned in the system.

Electrostatic Type—This is again a high-capacity unit. Air enters past a curtain of wires positively charged at 13,000 volts, so an electrostatic field is set up which charges passing dirt particles. These positively charged particles then are attracted to negatively charged collector plates (6,000 volts) in the air stream, which are periodically washed down automatically.

A combination filter recently developed has a special paper element built up of tissue-thin plies of short cellulose fibers in a haphazard pattern. An electrostatic charge causes the plies to separate so the fibers form a dust-catching screen. The paper is changed when dirty by turning a crank by hand or under automatic control.

General—Usual filters can handle air at 300 to 400 fpm. with fairly low dust concentration, a 20 x 20-in. unit filtering 800 to 1,000 cfm. Industrial dust loading is 0.8 to 2 grains per 1,000 cu. ft. Clean filters offer a resistance to air flow of 0.1 to 0.25 in. of water; dirty ones go up to 0.4 in. Usually a differential draft gage is installed around non-automatic filter banks to warn of overload when resistance goes up; otherwise fans will be overloaded.


Dry pocket type
Dry or viscous glass type
Viscous cellular passage type
A Crimped wire
B Expanded metal
Multiple-V dry-fabric type
Glove type dry pocket
Metal type filtering material crimped wire or expanded metal
Multi-panel fibre-coated wire-screen type

COMMON TYPES OF AIR FILTERS

Humidity Is Relative

A GIVEN volume of air will hold a fixed maximum amount of water vapor at any given temperature. *Relative humidity* is simply a measure of how much moisture air contains at a given temperature, compared with the maximum it could hold at that temperature. Saturation is 100%; so if the air holds only half its maximum, humidity is 50% R.H.

As the air rises in temperature, it can hold more moisture; as temperature falls, it can hold less. In the latter case, relative humidity will increase until the saturation point or "dew" point, when the excess moisture will begin to condense and precipitate.

You may have seen or used a sling psychrometer—a pair of thermometers, one with its bulb covered by a wet wick, side by side on a frame which can be whirled about a handle. When it is whirled rapidly, evaporation from the wick causes the wet bulb thermometer to give a lower reading—the saturation temperature—indicating the air can hold more moisture. The amount it reads lower than the dry-bulb thermometer varies with the humidity.

Dr. Willis H. Carrier devised the now-familiar psychrometric chart. If this were visualized with the dry-bulb thermometer along the bottom and the wet-bulb thermometer along the curve (top right), diagonal lines represent wet-bulb temperatures and the vertical ones dry-bulb temperatures. Relative humidity is shown by the curved lines.

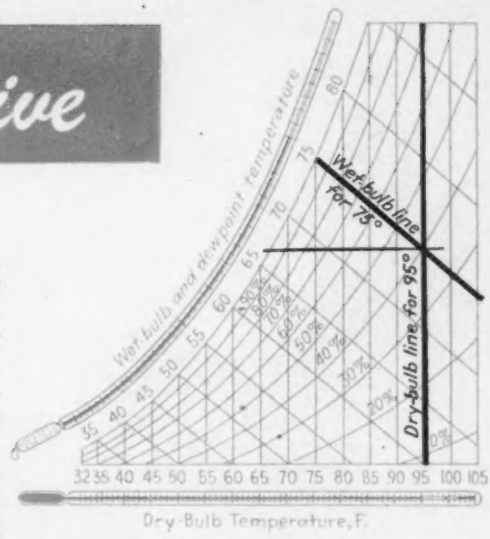
Assume, as shown, a wet-bulb temperature of 75°, a dry-bulb of 95°—a typical summer condition. The two lines intersect on the 40% R.H. curve, so relative humidity is 40%. Further, a horizontal line drawn left to the wet-bulb scale indicates dewpoint, which is 66¾°.

The length of the horizontal line represents dewpoint depression—the difference between dry-bulb temperature and dewpoint temperature. Any system which can maintain the necessary dewpoint depression will hold relative humidity constant, whether it does any cooling or not. Its dewpoint depression is practically constant for any given relative humidity and it is different for each different relative humidity.

It Ain't the Heat . . .

90° can be fairly warm and 90° can be so stiflingly hot that it is nearly beyond human endurance—all depending on the relative humidity of the day. Thus we see that dry-bulb temperature does not accurately measure the effect of heat on humans nor does relative humidity measure it . . . it is a combination of the two. This combination results in what is called Effective Temperature (for people normally clothed and slightly active in air moving at 15 to 25 fpm.) —not a temperature that can be read on a thermometer, but an index number of the relative degree of warmth or coolness which a person feels on exposure. For instance, 83° at 100% relative humidity will feel no cooler than 95° at 40% R. H., because both correspond to 83° ET.

Because Effective Temperature is only an index of human sensation, it will be better understood if it is tied in with conditions which are generally experienced. Scientists have revealed that 98 out of 100 people who have been acclimatized to summer conditions are normally comfortable at an Effective Temperature of 71°. A 75° ET is too warm for 50 out of 100 people. An 83° ET represents an exceedingly warm summer day according to unanimous judgment. An 85° ET is nearly the maximum heat experienced out-of-doors in southern climates. And 90° ET is beyond the upper limit of safety and endurance for people in average physical condition.



With these effective temperatures in mind, you can use the table below. By locating the temperature and humidity of your plant, you can instantly determine the effective temperature — and thus determine how closely conditions approach those of good efficiency for workers.

How to use this table: Find the proper relative humidity column across the top of the table, then follow down that column until you come to the dry-bulb temperature. Next read across to the right to find the Effective Temperature in figures in the right-hand panel. For example, at 65% R.H. and 88° dry-bulb, Effective Temperature is 82.

Dry-Bulb Temperatures, °F.	Relative Humidity													Effective Temperatures, °F.
	100%	95	90	85	80	75	70	65	60	55	50	45	40	E.T.
90	90	91	92	93	94	95	97	98	99	101	102	104	106	90
89	89	90	91	92	93	94	95	97	98	99	101	102	104	89
88	88	89	90	91	92	93	94	95	97	98	99	101	103	88
87	87	88	89	90	91	92	93	94	95	97	98	100	101	87
86	86	87	88	89	90	90	92	93	94	95	97	98	99	86
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84	84	85	86	87	87	88	89	90	91	93	94	95	96	84
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82	82	83	84	84	85	86	87	88	89	90	91	92	93	82
81	81	82	83	83	84	85	86	87	88	89	90	91	92	81
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78	78	79	79	80	81	81	82	83	84	85	85	86	87	78
77	77	78	78	79	80	80	81	82	82	83	84	85	86	77
76	76	77	77	78	78	79	80	81	81	82	83	84	85	76
75	75	76	76	77	77	78	79	79	80	81	81	82	83	75
74	74	75	75	76	76	77	78	78	79	79	80	81	82	74
73	73	74	74	75	75	76	76	77	78	78	79	80	80	73
72	72	73	73	74	74	75	75	76	76	77	78	78	79	72
71	71	72	72	72	73	74	74	75	75	76	76	77	78	71
70	70	70	71	71	72	72	73	73	74	75	75	76	76	70

One of 12 fan rooms in the Ford aircraft-engine building. Four units are in each room. Supply fan and its drive are at left, circulating pumps for humidifiers at right

Humidity Control

DEHUMIDIFY IN SUMMER

One or both of two methods are used to reduce the humidity of air. One is to chill it below the dewpoint, so moisture condenses out; the other depends on the ability of hygroscopic substances to abstract moisture.

Air may be cooled by passing it over ice, through a cold-water spray (below the dewpoint of the entering air), or a cooling coil. The colder the air becomes, the greater the amount of moisture which condenses out, but after-heating will be required to make it usable again.

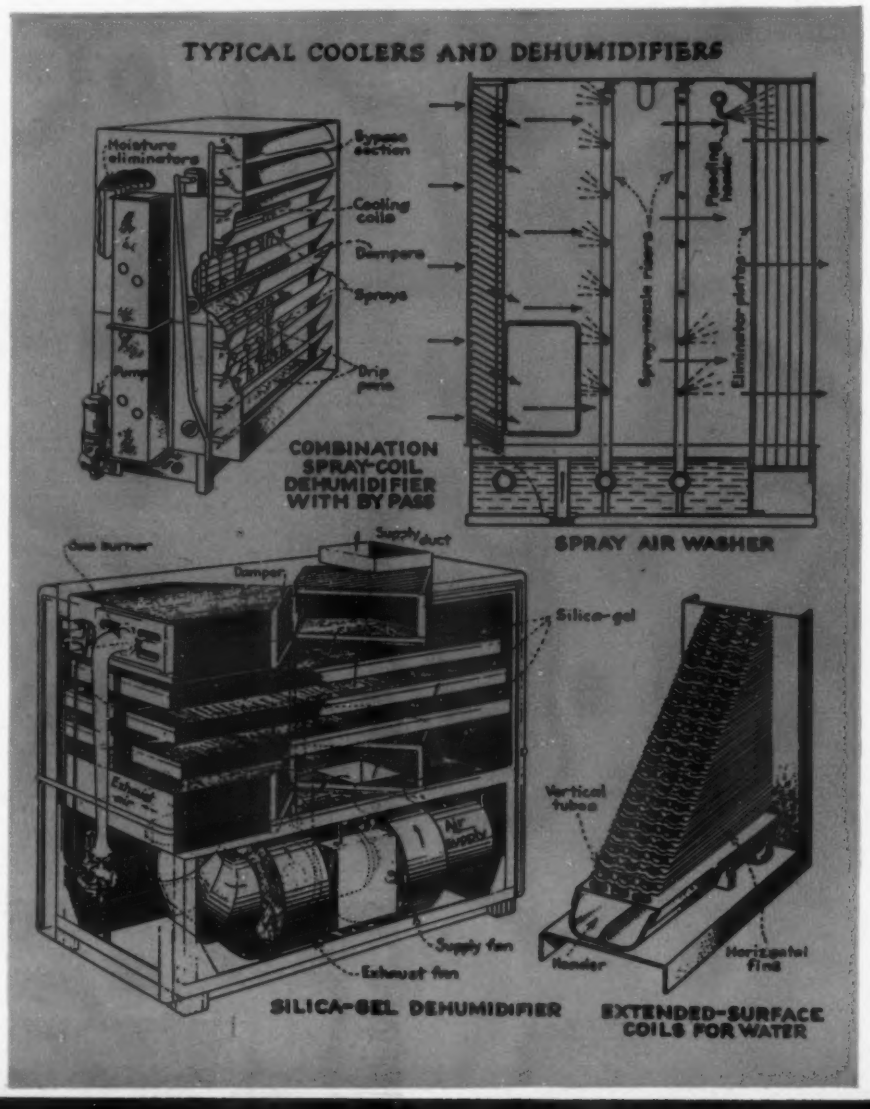
Spray Dehumidifier — This unit, also called an air washer, is simply a chamber into which chilled water is sprayed while air passes through. Water collects in the bottom sump and is pumped to the cooling system before reuse. Fine-mist spray from nozzles in one or more banks, wet surfaces, or a combination may be used. Outgoing air must be forced past baffles or eliminator plates to remove entrained droplets of moisture.

Hygroscopic Dehumidifiers—When low humidity is required, or humidity must be controlled independently of temperature, it is customary to supplement or replace previously described methods of drying air with a chemical device which carries sorbents (materials which take moisture from air). Such units are essentially rotating or stationary beds or a series of pans or trays carrying the sorbent, with fans and (in the case of solid sorbents) a gas-fired, steam or electric heater for reactivating the material, plus controls.

Dry Sorbents—Dry sorbents may be adsorbents or absorbents. Adsorbents like silica gel and activated alumina are really fine-pored mazes in which moisture is trapped. They do not change in the process. Absorbents may be solid or liquid and do undergo chemical or physical changes, or both, in taking up water. Solid absorbents include calcium chloride, silica gel and activated alumina, liquid ones are solutions of salts, like lithium chloride.

One type of dehydrator is a cylinder filled with the solid drying agent which rotates continuously; another has a stationary cylinder but a rotating damper. In either, three streams of air pass through: air to be dehumidified for the system, air heated to 300-350F. to reactivate saturated drying agent, and cooling air for the reactivated bed.

A non-cylindrical design has two sets of stationary trays carrying the sorbent, with automatic dampers so one bed of trays is drying system air while the other is being reactivated.



Liquid Sorbents—Air to be dried is brought into contact with a water solution of the absorbent. Moisture from the air dilutes the solution, which is then passed to a concentrator (a low-pressure steam heat exchanger where excess moisture is boiled off to reconcentrate the brine. Air temperature leaving these units may be reduced by precooling the absorbent.

Chemical dehumidifiers can deliver air with a moisture content of only 0.43 grains per lb. of dry air --hence are the answer for storage rooms, laboratories and gage rooms where low humidity must be maintained.

HUMIDIFY IN WINTER

Humidification is easily accomplished. It is commonly required in winter, may also be required in summer in rare instances in Metalworking (Textile plants humidify the year round). Air passing through a washer can pick up moisture, particularly if it or the water is preheated so the air is "thirsty."

Direct Humidifiers—Many direct humidifiers are available, the simplest being jets or nozzles which spray moisture as a fine mist directly into the air. Air may also be passed over wet surfaces (fine-mesh wire or cloth) or exposed to a steam jet (with accompanying disagreeable odor), or water may be evaporated into the air. Pan-type or wetted-surface units must be cleaned frequently to rid them of dirt.

Control—Close control of humidification is provided by humidistats. These are devices which expose wood, treated-paper or human hair to the air. Change in dimensions of these elements with changes in humidity open or close contacts which control relays that operate valves or dampers.

Another humidistat has two thermostatic elements, one controlling dry-bulb temperature while the other (inside a wet-cloth sleeve or spray) controls wet-bulb temperature. Double control at predetermined ratios can hold relative humidity almost constant.

General—Humidity is difficult to hold at desirable winter levels in conventional buildings because condensation will occur on windows, walls and metal surfaces. Where winter humidities higher than 20 to 30% are required moisture must be added faster than it can condense out, room temperatures must be lowered, or windows must be blanketed with a blast of hot air. Windowless buildings do not present this problem to any great extent.

Heating

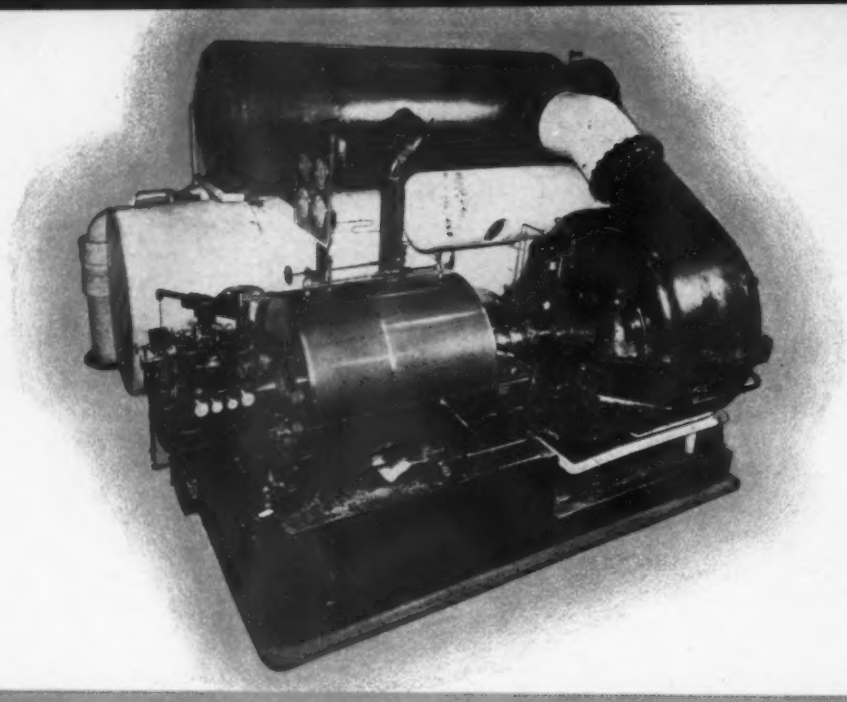
PARADOXICALLY, it may be necessary to heat air even in summer—if the air is cooled below the comfort range to condense out excess moisture. It would appear more sensible simply to mix in the too-cool air but this is difficult to do without causing discomfort and drafts.

Heating surfaces for conditioning equipment are usually finned tubes —in fact frequently are the same coils used for summer cooling. This is possible because heating loads are comparatively small in a windowless or "sealed" plant, the prime necessity being to heat or "temper" ventilation air brought in. Hot water and steam are both used for circulating media.

Heat Pump—The "heat pump" or reverse-cycle refrigeration setup has been extensively discussed for years as a clean, convenient and economical combined heating and cooling device. It is all of those, but like anything else, has its disadvantages and specialties. It follows the conventional cycle, being in principle just a large-size household refrigerator, with the area to be conditioned the inside of the refrigerator in summer and the outside or "hot" section in winter. The first unit for home use has just been announced.

Air-conditioning engineers see its potential particularly in areas where the amount of heat to be removed in summer is greater than that to be added in winter—in other words where the heating load is not too great. (When heat must be extracted from a blizzard, the cost is terrific.) But there is always well water from which to take "heat," power costs are being lowered steadily, building insulation is being improved and more efficient refrigerating equipment devised—these factors all favor the heat pump. Further, where large amounts of refrigeration equipment are required to handle summer load, it may be practical to adapt it for winter heating also.

Two high-pressure oil-and-gas fired boilers at Oklahoma City. At rear on the mezzanine are refrigerating compressors. Special vertical-lift door enables easy handling of equipment and materials



One of six, 1,000-ton, turbine-driven, centrifugal refrigerating compressors in the Ford aircraft-engine building. Turbines operate at 4500 rpm.

Cooling

TAKING heat from the air is one of the biggest jobs in air conditioning. Air may be cooled by passing it over ice or through a cold-water spray (well water is usually 55 to 60 F.), but more commonly a heat exchanger is used, the air passing over finned coils (disks, spirals, squares or strips on the outer surface) through which cold water, brine or a refrigerant flows. The latter is the direct-expansion system. Heat exchange also reduces humidity because air becomes less "thirsty" at lower temperatures—the reason for the frost on your julep.

Evaporative cooling occurs when air is passed through a water spray. Some water is evaporated, taking its latent heat of vaporization from the air, thus lowering the air dry-bulb temperature, *but not its wet-bulb temperature.* Because only this temperature differential is obtainable, the process is effective only when normal wet-bulb temperature is low or where cooling load is largely sensible heat.

Indirect systems may be either mechanical or chemical. Three types of compressors produce mechanical refrigeration; reciprocating (like an air compressor or piston pump), centrifugal and steam jet. The compressors simply apply pressure to a fluid which is a gas at normal temperatures, then pass it to condenser tubes outside which cooling water or air flows. The gas thus becomes a liquid, the refrigerant, which can be pumped under pressure to any desired point within reason. Common refrigerants are ammonia (rarely used in air conditioning because of its toxicity), carbon dioxide (safer, but less economical), methyl chloride, dichlorodifluoromethane (Freon) and monofluorotrichloromethane (F_{11}).

The condenser, if air cooled, is an extended-surface coil outside the area to be conditioned. Water-cooled condensers may be double-pipe (cooling water in the inner pipe, refrigerant in the outer), shell-and-tube, and shell-and-coil. Cooling water may be wasted if plentiful, but even when pumped from wells, water costs enough money that the effort is made to reuse it. It is usually passed through a cooling tower or an evaporative condenser. The first is a wood lattice shell within which the water is sprayed while air is blown or flows through the louvers horizontally. The open type, seen on the ice-plant roofs, makes use of atmospheric air. The closed or mechanical type has a blower and may be inside or outside the building. An evaporative condenser is a finned tube in a housing with water sprays and blown air.

Cooling water may be passed along for process. National Brass Co., Grand Rapids, Mich., runs it to a plating department to reduce steam load for heating water there. Grumman Aircraft sprays it through a roof piping system to supplement the ceiling insulation on hot days.

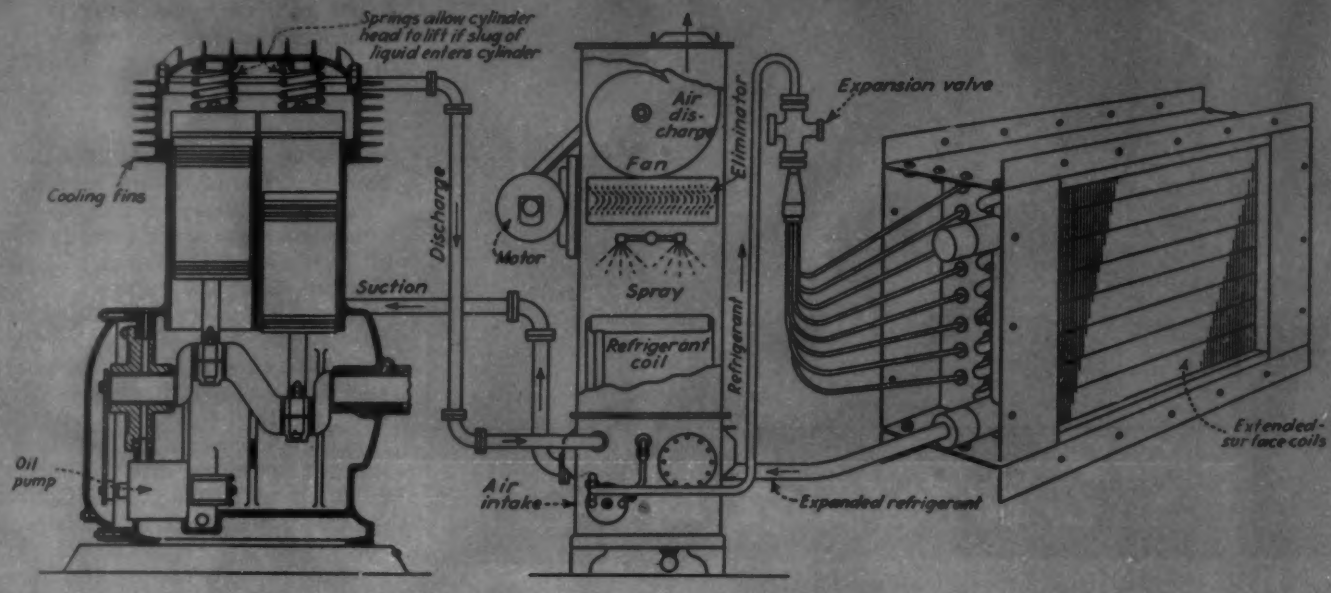
Centrifugal compressors are basically like centrifugal pumps, producing pressure by imparting kinetic energy to the refrigerant vapor (usually F_{11}). Inherently high-speed machines, they may be direct-driven by motor or steam turbine, or by diesel or gas engine. They may be geared to higher speeds than the driver, and usually have two or more stages to attain the desired pressure. For economy, the evaporator or cooler is usually built in. Reciprocating compressors, the familiar "ice machine," are usually driven by steam engine, or belted or direct-driven from a diesel, gas engine or motor.

The liquid refrigerant passes through an expansion valve to the evaporator. There it picks up the heat from water or brine (which the latter in turn picked up from the air in the conditioned area).

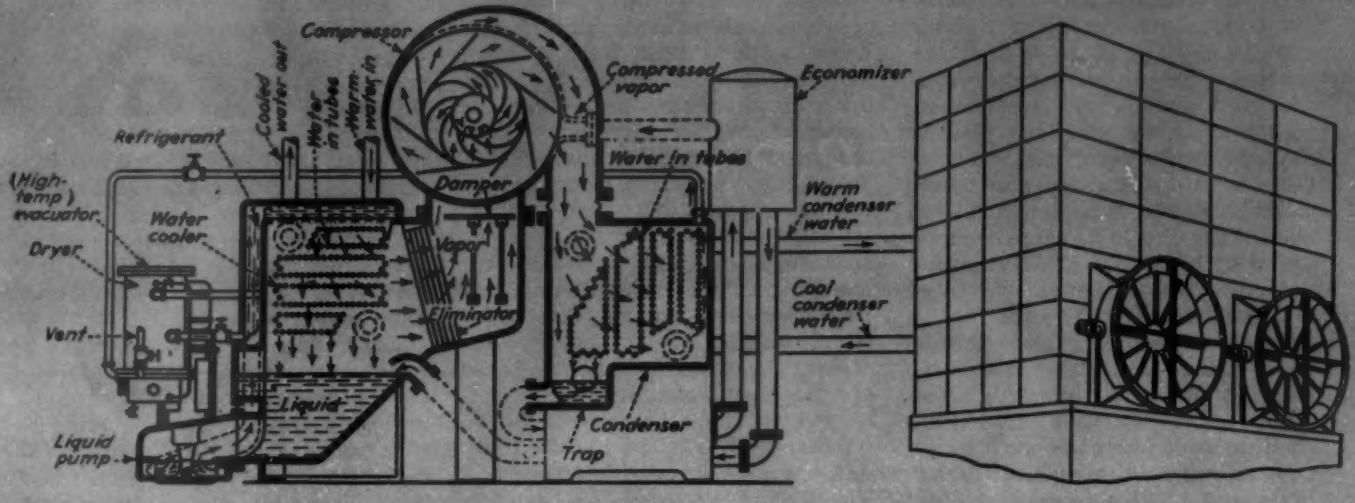
Steam-jet Compressor — Under a high vacuum, water will turn into vapor at low temperatures, taking the necessary heat from itself. This is the basis of steam-jet compressors, suitable where low-cost steam is available. Water from the conditioning system is sprayed into an evaporator tank, from the top of which lead a series of tubes to steam ejectors or jets. Aspiration of the jets creates a partial vacuum and draws vapor from the evaporator, forcing it into a condenser, from which it is withdrawn as condensate. The main body of water is thus cooled and may be pumped back into the system.

Chemical Cooling—In a system of cooling in which moisture is removed from air by a hygroscopic salt solution, the latent heat (turned into sensible heat) is removed by cooling water flowing through extended-surface coils. A portion of the diluted solution is pumped to a concentrator where it is warmed in a heat exchanger by the leaving concentrated solution, which is thereby cooled. Passing to the top, the dilute solution is further warmed and sprayed over two layers of evaporative packing with steam-heating coils between. This entire passage is counterflow to a current of outside air. Moisture is evaporated at a rate controlled by the amount of steam admitted to the heating coils.

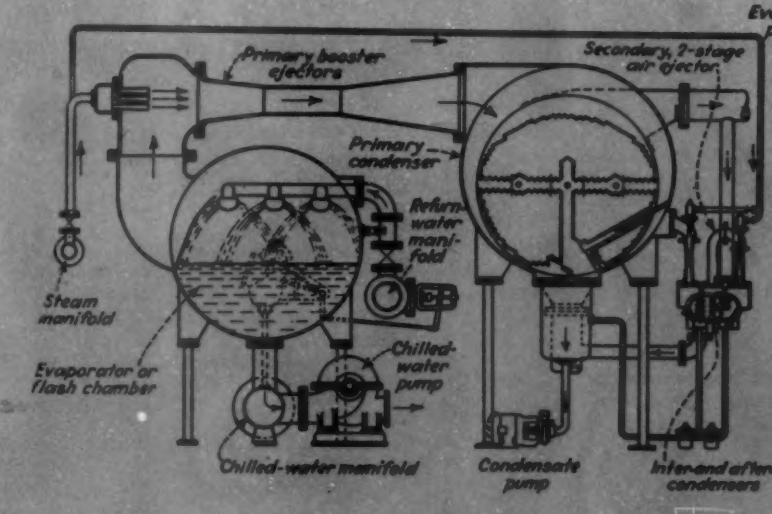
REFRIGERATION EQUIPMENT



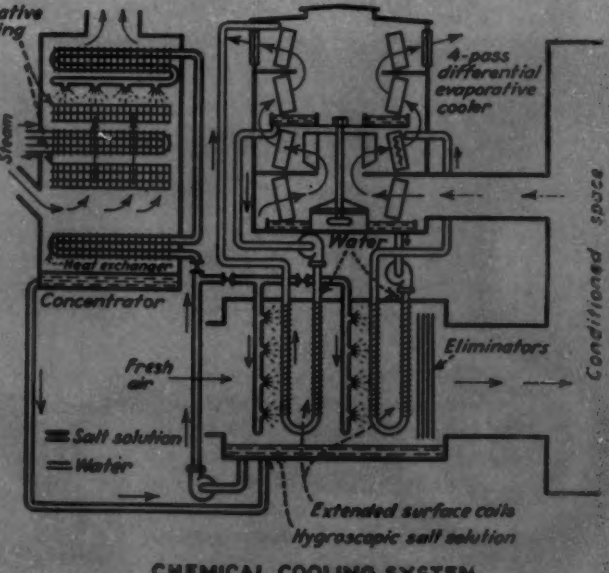
RECIPROCATING COMPRESSOR WITH EVAPORATIVE CONDENSER AND DIRECT-EXPANSION COIL



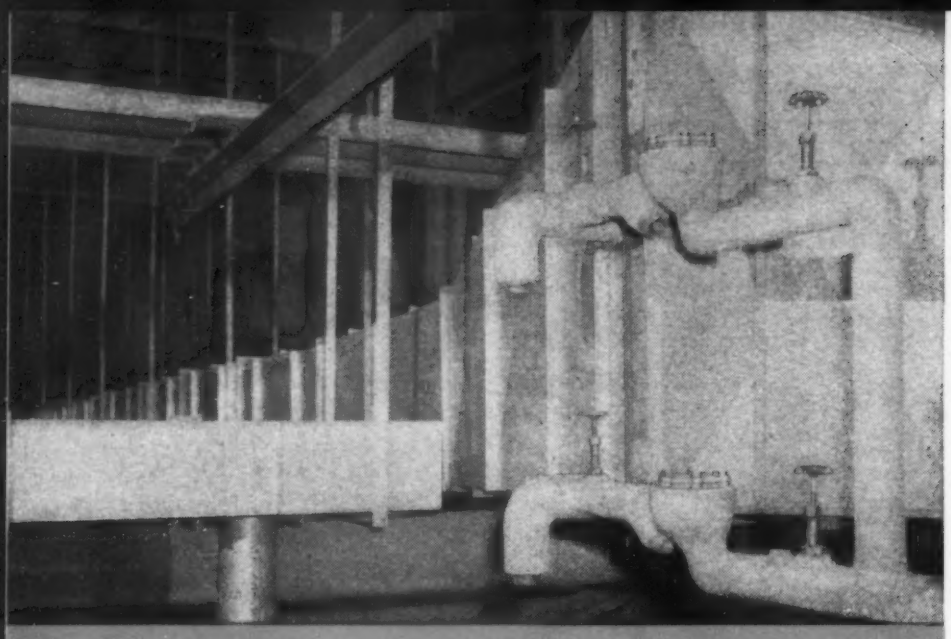
CENTRIFUGAL-COMPRESSOR-WATER-COOLER-CONDENSER UNIT AND COOLING TOWER



STEAM-JET UNIT



CHEMICAL COOLING SYSTEM



Special booster coils in ducts over doors expedite temperature control in windowless plants. Insulated pipe (right) supplies steam in winter, cold water in summer, to balance temperature

Distribution

CONDITIONED air is delivered from central systems through ducts, usually of 18- to 26-gage galvanized or copper-bearing sheet steel and rectangular in cross-section. Outlets may be simple grilles or diffusers with deflecting vanes or louver shutters. Practical duct length is about 400 ft. max.; practical top size 100,000 cfm., with more common practice 40,000 to 65,000 because building costs are lower.

Ducts should of course be as straight and as near square as possible (never have one dimension over 10 times the other). Short-radius bends and sharp dimensional changes should be avoided; if necessary, they should incorporate directing vanes. These precautions will reduce fan size and loading.

Noise will crop up where ducts are too small to keep air velocity below 1,200 to 1,600 fpm. in main ducts and 600 to 1,200 fpm. in branch ducts or where they are so light in construction they vibrate. Sound-absorbent linings and canvas joints help. High velocities also increase friction losses.

Centrifugal Fans—Three types of centrifugal or radial-flow fans are widely used in air conditioning, distinguished from one another by the curvature of their blades with respect to wheel rotation. These are the forward-curved, backward-curved, and the reverse-curved or combination. The forward-curved unit has a flatter pressure characteristic at high pressures, but it has a hump in it, and horsepower increases as the volume of air handled increases. The backward-curved and combination blades do not have this hump and horsepower actually drops off at higher air volumes. Efficiencies are about the same.

A major factor in choosing centrifugal-fan type is the drive. A backward-curved fan operates at a peripheral speed about 2½ times that of the forward-curved fan, hence for a given static pressure its speed is better for direct connection to motor or turbine. But its lineal dimensions are 25% greater, its cubage 100%. To avoid noise and inefficiency, it is important to know system resistance and required volume very accurately. Large installations commonly use centrifugal fans.

Axial-Flow Fans—In axial-flow or propeller fans or blowers, the direction of air flow is parallel to the fan axis, in contrast to the centrifugal type, in which flow is at right angles to the axis. A wide variety of shapes and sizes are made, with cast or formed metal blades, either flat or shaped. These fans are useful where reisistance is small and some noise is not objectionable—as in unit conditioners.

The basic problem of selection is an engineering one—the system-resistance curve should pass through the fan-pressure-volume characteristic curve at about the point of highest efficiency, considering space available and permissible noise level.

We Acknowledge . . .

. . . assistance of many companies, individuals and articles published in air-conditioning magazines. These sources will provide much more detailed information. Installations in your neighborhood will also be found helpful. Major contributions include:

MANUFACTURERS

American Blower Corp., Detroit.
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Niagara Blower Co., New York, N. Y.
Trane Co., La Crosse, W s.
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Meyers, Strong & Jones, New York.
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Turner Construction, Philadelphia.

MAGAZINES

Heating, Piping & Air Conditioning,
"Ford Sets High Air Conditioning Standards"—J. J. Floreth Dec., 1937, Feb., 1938.
"Precise Weather for Precision Work"—W. S. Bodinus, Sept., 1942.
"When Is Complete Air Conditioning of the Modern Factory Advisable?"—H. A. Mosher, June, 1945.
"Air Conditioning of Blackout Plants"—W. A. Grant, 1942.
"Should Factories Be Air Conditioned?"—R. D. Tutt, W. E. Goohs, F. G. Tyke, Jan., 1945.

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Power
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Factory Management & Maintenance
"Air Conditioning—What It Is and What It Does"—G. A. Van Brunt, August, 1946.

A FREE ECONOMY IS WORTH FIGHTING FOR

BUSINESS must take the initiative if the price decontrol machinery, set up by Congress, is to be effective. The present price control law is far more than a set of instructions to the administrators of OPA; it is a challenge to business to be aggressive in speeding decontrol decisions and in persuading the Price Decontrol Board to adopt a strong stand for return to a free economy.

Thus far business has not met this challenge. *Two months after the passage of the new price law not a single application for decontrol of a major product had been filed by an industry advisory committee.* This is due in part to the red tape controlling such applications. Nonetheless, a continuation of such inactivity on the part of business can well result in perpetuating price control far beyond the time either the present law or sensible economic policy require.

It was the clear intent of Congress to hasten our return to a free economy. In the legislation continuing the general control of prices, Congress formally declared its purpose to have it "terminated as rapidly as possible."

To accomplish this, the House originally approved a formula which would have made decontrol mandatory when production had attained a prescribed level. The automatic decontrol provision was dropped before the bill was finally passed, partly because of the uncertain effects of strikes on production. But Congress did not mean to return the timing and extent of decontrol to the administrative discretion of OPA.

On the contrary, to assure having price control "terminated as rapidly as possible," Congress created a Price Decontrol Board and gave it power to overrule OPA when the board finds price control should be removed. Moreover, it gave to industry the right and the responsibility to seek decontrol. Also, in a further effort to speed up the decontrol process, it placed narrow limits on the time allowed for board decisions.

Congress had compelling economic reasons for doing its legislative best to speed up decontrol.

1. It is by all odds the best way to eliminate the bottlenecks in production and the black markets which have plagued the country since V-J Day.

   Rigid price ceilings promote shortages of badly needed commodities by discouraging their production. Such shortages both upset the flow of production and promote black markets. At present a considerable part of American industry is stymied by shortage of critical parts and materials. Price control is much to blame.

2. There must be flexibility of prices if a round of new wage adjustments, which may be forced on industry early in 1947, is to be negotiated without grave risks of seriously curtailing production.

   When, under the leadership of the national administration, the first post V-J Day round of wage adjustments was made, price ceilings were held rigid while wages were boosted. The result was a series of price-wage squeezes which upset production. They would have been disastrous if we had not been in a sellers' market, created by a tremendous accumulation of wartime shortages. In 1947, however, many industries will be in a buyers' market. It must be possible, therefore, to have wage increases reflected promptly in price adjustments if we are to avoid a repetition of the costly post V-J Day round of strikes, which often had price control as the key issue.

3. Rapid decontrol is necessary to maintain a high level of employment and production.

   Almost five years of price control inevitably twisted the factors of production and distribution far out of the equilibrium which would prevail in a free economy to which it is the clear purpose of the nation to return. Unless the return to a free economy is facilitated by a speedy and orderly decontrol, the jolt of an abrupt return to competition can be expected to upset employment and production seriously.

It's Up To Business

To encourage speed and boldness in decontrol, Congress provided for the reimposition of control over any prices which, after being released, might

get out of hand. The dangers of this sort are chronically exaggerated. During the 25-day period in July when there was no price control the Civilian Production Administration found that "manufacturers of finished industrial and consumer products have generally exhibited commendable restraint in increasing prices no more than increased costs."

All of this endeavor to speed up decontrol and expand its scope is likely to be futile, however, unless business furnishes the driving power for the machinery Congress provided. OPA certainly will not do it. Neither can the Decontrol Board be expected to go out and drum up cases.

The necessity for vigorous action by business in pressing for decontrol is increased by the fact that the general legislative standards to guide decisions by the Decontrol Board are vague. They must be clarified and sharpened by decisions in specific cases.

The main principle to guide the decontrol of non-agricultural products is that price ceilings shall be removed when supply is in approximate balance with demand. But what precisely does that mean? The meaning will become clear only through Decontrol Board decisions.

The same is true of the principle which makes automatic decontrol of a non-agricultural commodity contingent on whether or not it "is important to business costs or living costs." Business must press cases which will give specific meaning to those vague terms if decontrol is to get on apace.

Cards Are Stacked

At present the government has the cards pretty well stacked against rapid decontrol.

First, the key members of the staff of the Price Decontrol Board are holdovers from the Bowles regime which emphasized the importance of carrying on price control rather than speed in getting rid of it.

Second, in exercising his authority to prescribe regulations to govern petitions for decontrol, the OPA administrator has required excessively complicated statistical and economic data. Manufacturers who are sure they can convince any fair-minded board of the desirability of decontrolling certain of their products assert that they are blocked by statistical entanglements.

Third, OPA has discouraged business from moving immediately under one section of the law to speed decontrol. This section provides that products "not important in relation to business or living costs" may be freed from price ceilings immediately and must be freed by December 31, 1946, unles OPA specifically finds they are important to these costs. Instead of making it possible for business to move under this section now, OPA has issued rules which have the effect of blocking such a course until the end of the year.

In the light of obstacles such as these, it is not surprising that the record of decontrol to date is not impressive.

Decontrol Record

Since June 30 there has been a drop from about 70% to about 60% in the total value of products under price control. But most of the drop has been accounted for by food products, which Congress took the lead in decontrolling, and by industrial machinery which was being decontrolled when Congress acted. By far the larger part of manufactured consumer goods remains under control.

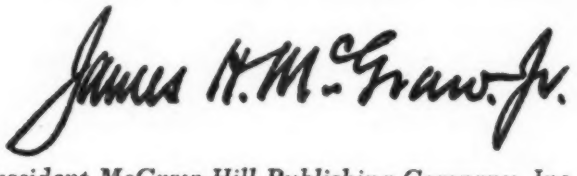
This, however, is no time for business to be discouraged. Rather, business should accept the obstacles put in its way as a challenge and work harder than ever for speedy decontrol.

The case for decontrol should not be stated in narrow technical terms. It should be based on grounds of broad public policy, and should demonstrate how a speedy return to a free economy can hasten the full release of the nation's productive power.

For example, there should be very clear demonstrations of how, in far too many cases, rigid price ceilings—(1) discourage production of key parts and materials by making such production relatively unprofitable, (2) create shortages of key parts and materials which tie up broad ranges of production or result in piling up lopsided inventories of partially completed goods, and (3) thus cut away the foundations of a stable economy and the prospects of steadily sustained employment.

There should be equally full demonstrations of the well known sequence from shortages to unrealistic price ceilings to black markets. Meat prices are rolled back, but the meat is rolled under the counter.

A free economy is worth fighting for. Liberty is preserved only by the constant struggle of those who believe in it. Neither the interests of the nation in a strong and well-balanced economy nor the interests of business itself will be served by drifting at this time. Now is the time for business to lead a strong offensive for speedy elimination of price control.



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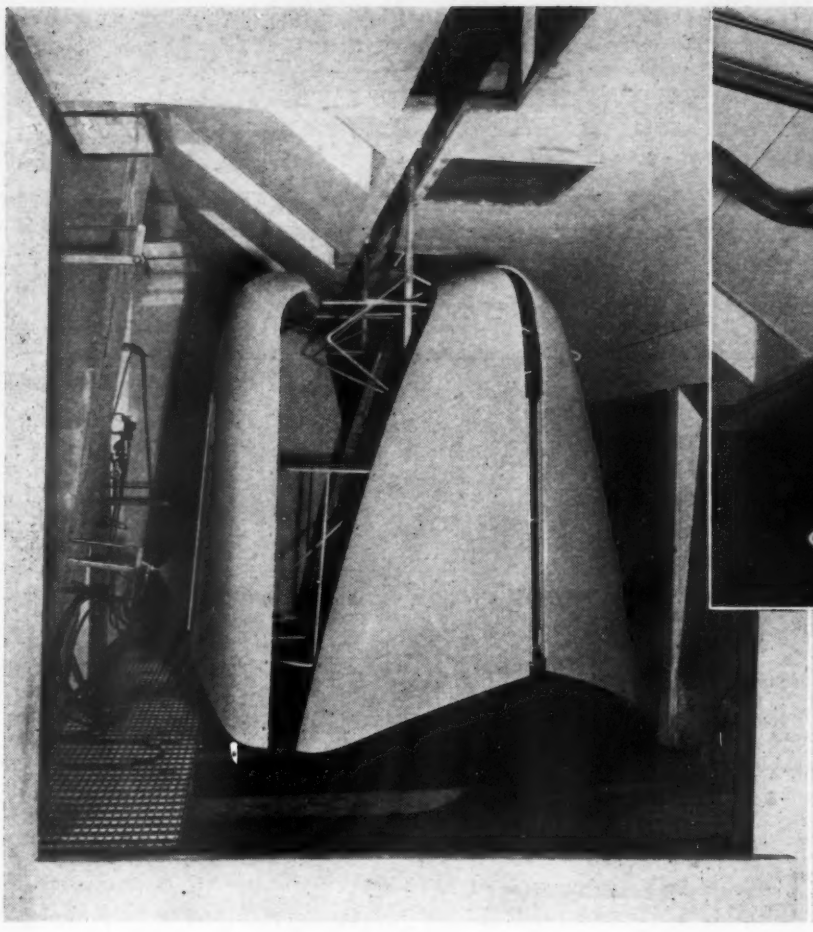
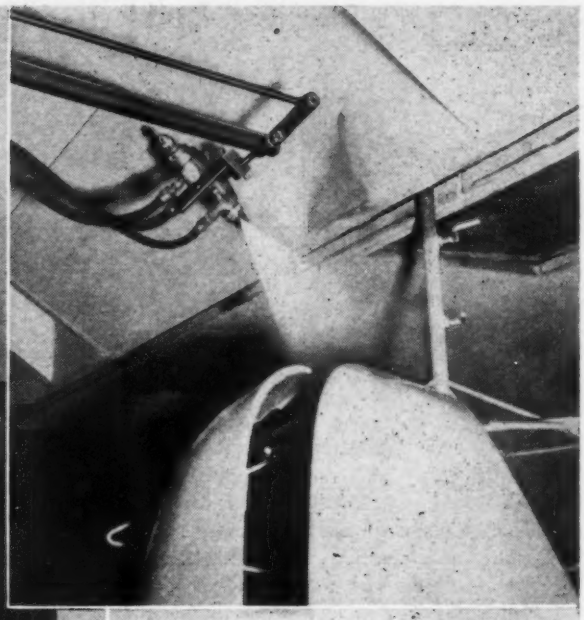




▲ A linkage in the spray arm always points the gun at right angles to the work profile

◀ Conveyor racks move from station to station of the automatic spraying booth at 52-sec. intervals. When opposite an operative station, the rack spins while the spray arm (left) moves up or down

Dodge Sprays Paint Automatically On Fenders and Hoods

BY RUPERT LeGRAND, ASSOCIATE EDITOR

IN 1939, Dodge purchased one of the first automatic paint-spraying machines used in the automobile industry. Wheels were loaded on a turn-table that passed by spray arms on an oscillating carriage. This device caused the spray guns to follow the work-rotating spindle for a definitely timed period, and then returned the guns to pick up the next wheel entering the spraying zone. Sprays were turned on and off automatically by cam-controlled mechanisms. This installation saved floor-space and applied more paint in an evenly distributed film to the wheels than possible by hand spraying, but of course the part handled was of relatively simple contour and was not large in area.

The problem of automatically painting large sheet-metal components of complex contour has been solved. Twelve automatic machines are now applying the finish coat of synthetic enamel to front and rear fenders, hoods, stone shields and the fender center panel stamping above the radiator grille. So, today, the body is the only large sheet-metal assembly still sprayed by hand.

Large-area sheet-metal parts of changing contours can be painted by machine if work rotation and spray arm travel are coordinated

All of the contour spraying machines operate on the same principle. An overhead chain conveyor carries racks of parts into a tunnel-type spray booth with water-wash back walls. Usually there are four stations in the machine. Each of these stations is equipped with a mechanism that causes the spray arm to follow the work contour. Every 52 sec. the conveyor moves the racks ahead approximately 8 ft. to the next station and stops "on a dime," because of a magnetic braking system and adjusting mechanism applied to the drive.

After indexing, the rack is caused to spin at a definite number of revolutions per minute by means of a friction drive to a wheel fixed to

ARRANGEMENT OF FENDER-SPRAYING MACHINE

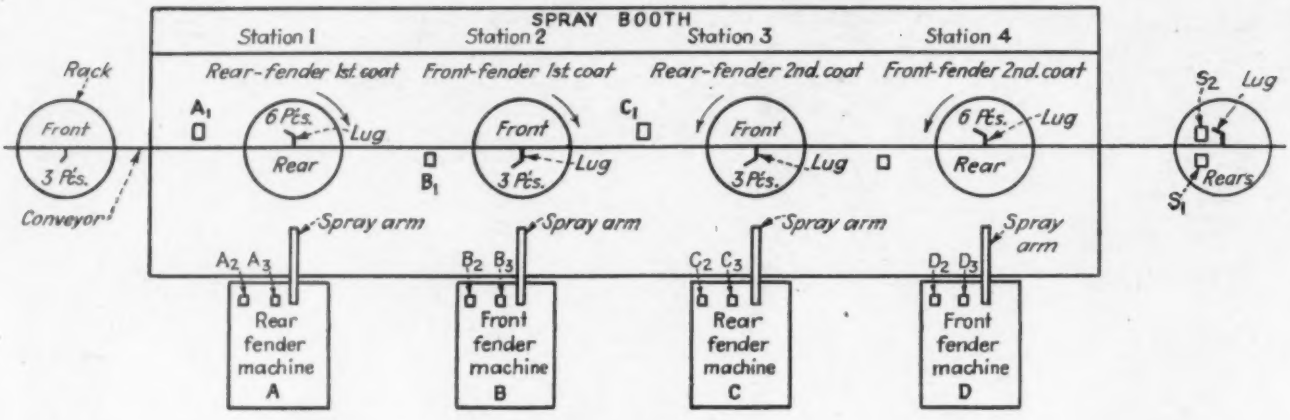


Fig. 1—Lugs on top of the spinner trolleys for the racks control operation of the automatic spraying machines. When a rack of front fenders advances to a rear-fender spraying machine, that station remains idle

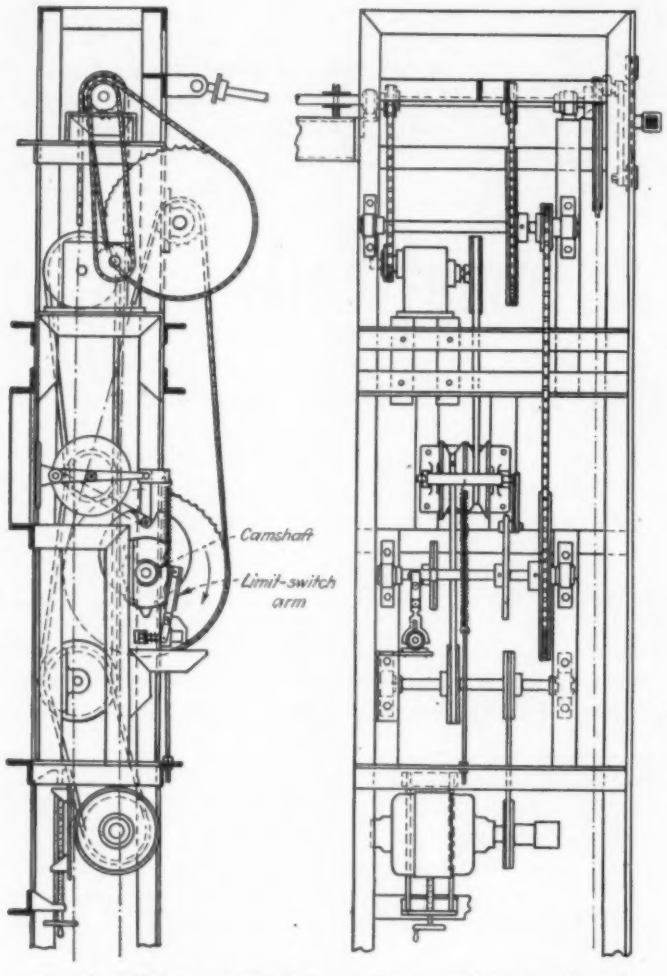


Fig. 2—All four automatic spraying machines per booth are identical with this arrangement. Cams for spray-gun air supply, starting the conveyor and shutting down the machine are located on a common shaft

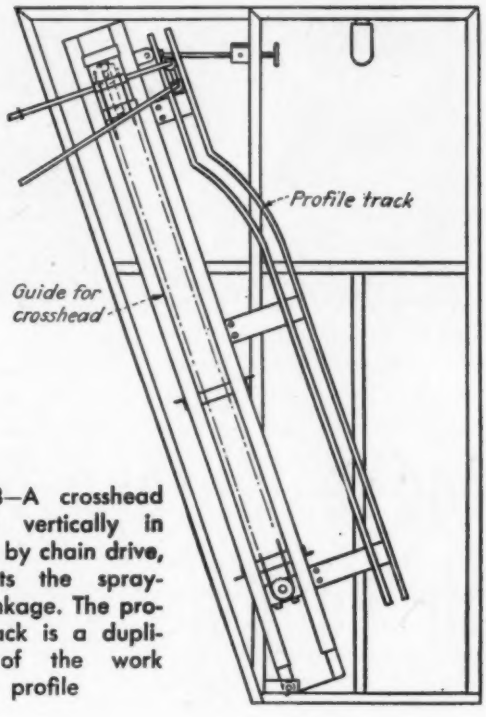


Fig. 3—A crosshead moved vertically in guides by chain drive, supports the spray-arm linkage. The profile track is a duplicate of the work profile

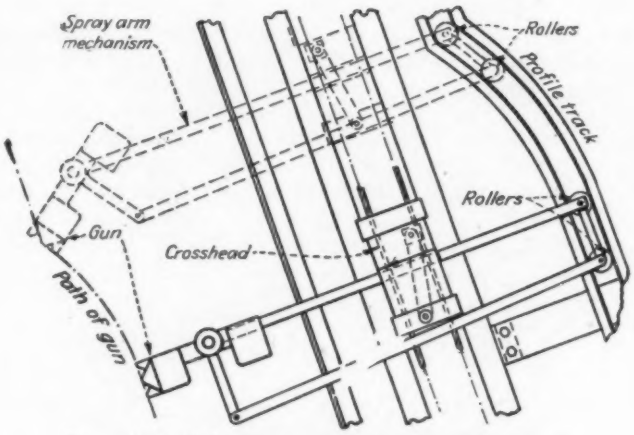


Fig. 4—A linkage causes the spray gun to point at right angles to the work profile as the spray arm moves up or down

the rack support, just below the conveyor. And the spray arm makes one upward or downward pass, the gun being kept always at a constant distance from the work and at right angles to it, because of a cam-track that duplicates the work contour.

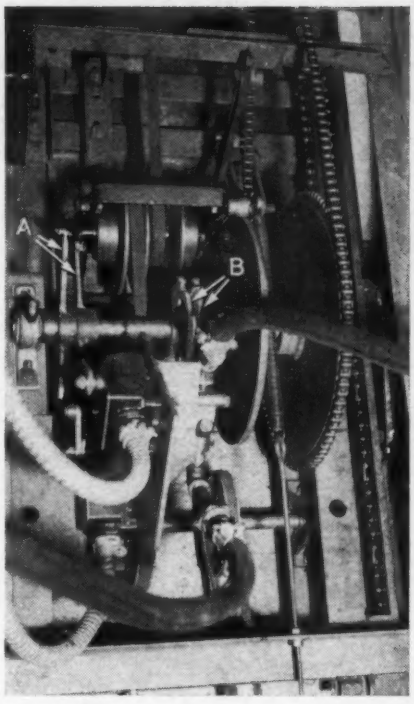
Fantails are avoided because speeds of rack rotation and arm traverse are related to give a 2 in. overlap per revolution. Edges of the pieces are effectively coated by aligning the spray arm with the vertical centerline of the rack and pointing the gun 10° toward the oncoming edges. The spray arm travels about 8 ft. in 52 sec. To overlap the spray pattern effectively, front and rear fender racks spin at 24 rpm., hood racks at 32 rpm.

Color Changes Easily Made

Experience with these spraying machines leads to the conclusion that more paint can be applied, and more uniformly, to fenders, hoods and stone shields than was formerly possible with hand spraying. Besides, color changes are accomplished more readily, and the investment in guns is greatly reduced. There is only one gun at each station, instead of one for each of the 13 colors normally required in production. When a color change is required, the machine attendant uncouples the hose from the paint manifold and puts it on the connection for the next color. A complete color change requires only 3 min., and only three racks are skipped to avoid applying a second coat of the wrong color to work in the machine. By the time the spray arm reaches the edge of the pieces on the rack, the old color has been blown out and the new color is applied. Color changes are made so easily that banks of baked parts of a specific color can be cut down, thus saving floorspace in assembly areas.

Spraying machines are operated to produce the equivalent of 100 complete sets of the mentioned items per hour per machine.

A detailed analysis of the operation of a typical front- and rear-fender spray machine follows: Front- and rear-fender racks are hung in alternate pairs on the conveyor. Assume that two pairs of racks are in the spray booth (Fig. 1), and that the cycle has just started. Spray machines *A*, *B*, *C* and *D* are connected to spinner motors, which spin the racks while the machines are in operation.



Cams *A* turn the air supply to the spray gun off and on; cams *B* start the conveyor and shut down the spraying machine in proper timing

A constant-speed motor within a spray machine (Fig. 2) drives a Reeves adjustable-speed pulley. Power take-off from the pulley drives: (1) a camshaft on which there are two double-lobe cams adjustable with respect to each other, and (2) a chain-operated crosshead that moves up and down in a guide (Fig. 3). The crosshead carries with it a spray-arm linkage (Fig. 4). As the spray-arm linkage moves up or down, rollers engaged in a profile track cause the linkage to slide laterally in the crosshead, thus keeping the spray gun at constant distance from the work profile. And simultaneously, the linkage is constrained by the rollers to point the gun at right angles to the work profile.

When Spray Machines Operate

When the conveyor moved the racks ahead one station to the arrangement illustrated, lugs on top of the spinner trolleys selectively contacted limit switches A_1, B_1, C_1 and D_1 to start the proper spray machines. By "selectively" is meant this: lugs for the rear-fender racks are on one side of the conveyor; lugs for front-fender racks are on the opposite side of the conveyor. With the racks in the spray booth as shown, stations 1 and 2 are operative because lugs have contacted limit switches A_1 and B_1. Stations 3 and 4 are inoperative, because limit switches C_1 and D_1 were not tripped.

To continue with cycle; spray machines *A* and *B* have been started by limit switches A_1 and B_1, and their spray guns are traveling either up or down the profile track. When the edge of the piece is reached, a cam in the machines turns on compressed air to operate the automatic spray gun. As the gun leaves the piece, the cam turns the air off, which in turn shuts off the gun, but spray-arm movement continues to the end of the stroke. All this time, the two double-lobe cams in spray machines *A* and *B* are rotating. Because front and rear fenders are involved, the cam lobes in the two machines are not timed the same. The first cam in machines *A* and *B* trips limit switches A_2 and B_2, which are wired in series. When both limit switches are tripped, the conveyor starts and moves until the lug on the rear-fender rack previously at station 4 strikes limit switch S_2. Meanwhile the cam assembly in machines *A* and *B* continues to rotate until the second cam in both cases trips limit switches A_3 and B_3, stopping the machines.

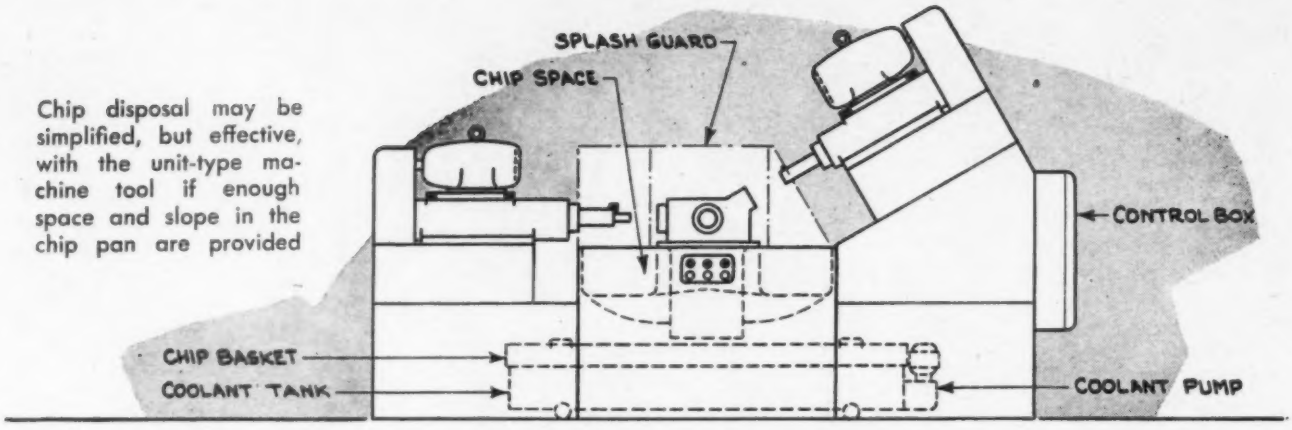
At the second cycle, a front-fender rack moves into the spray booth. Limit switches A_1, B_1, and C_1 are not tripped. So only station 4 is left operative during the second cycle.

During the third cycle, another front-fender rack moves into the spray booth. Again, limit switch A_1 is not tripped, but B_1, C_1 and D_1 are tripped. Hence, stations 2, 3 and 4 are made operative.

Production Is Balanced

At the fourth cycle the arrangement illustrated is repeated. Thus, in three cycles, the machine delivers six racks, two of rear fenders and two of front fenders, or an average of two racks per cycle. Production of the twelve machines is balanced to produce 100 sets per hour per machine.

Thus, an automatic paint spraying machine for contour work has been developed to duplicate the handling of spray guns by hand, but with the advantage that enamel is applied more uniformly and in a heavier coat. Furthermore, power-driven racks permit more pieces to be handled per spray station, thus conserving floorspace.



Chip disposal may be simplified, but effective, with the unit-type machine tool if enough space and slope in the chip pan are provided

Machine Tools of Tomorrow—3

FURTHER DESIGN CONSIDERATIONS

By DR. GOSTA R. TRUEDSSON, CONSULTING ENGINEER

Machine tools having relatively few subassembly groups may be the answer to chip and coolant needs, special product requirements and manufacturing costs

CHIP AND COOLANT handling, because of steadily increasing rates of metal removal, will be a major design consideration in the future machine tool. Too often in the past the user, primarily interested in performance, has had to add additional chip and coolant devices to meet his needs. Yet, conditions which made this necessary could have been predicted at the design stage by calculating the rate of metal removal and volume and character of chip produced.

Instead of designing a machine tool merely to its requirements of work stroke, work clearance, drive power and styling, future machine tools may have to be designed around the chip and coolant needs. Other functional characteristics, with their operating and maintenance problems, will then be considered until a production machine is designed which meets customer requirements and possesses clean lines.

This will result in construction of machines somewhat different from those customarily seen on production lines. For one thing, they will be more functional in appearance, and will lack some of the conventional styling steps considered necessary for commercial reasons.

Sudden demand for large quantities of high-production, single-purpose machine tools at the outbreak of war motivated several major changes in design and construction. Designers found it was possible to build special machines from comparatively few groups of subassemblies and at lower cost. Straight-line production was also encouraged in shops with schedules which did not otherwise justify these methods. Subassembly design, as compared to the "frozen" type, offers greater flexibility in meeting special product requirements and suggests a rational solution of chip and coolant problems. It also presents ways and means of standardizing machine-tool elements in future manufacturing techniques.

A machine tool, composed mainly of subassemblies and a center portion, has only one variable which, in the example shown here, is the work-supporting section. Thus, it becomes possible to design the tool so adequate space is provided for chips, and so the chip pan and chute have sufficient slope to wash the chips into the main receptacle at the rear of the machine.

The combination chip receptacle and coolant reservoir should be made large enough to handle chips for a high-production run and to provide enough coolant capacity to insure easy control of its temperature and quality. A generous flow of cutting fluid or coolant, controlled by a valve and limit switch to operate only during the machine cycle, will do a good job of washing down most types of chips. Where the nature of the chips may cause difficulty, a mechanical conveyor of simple design can be economically applied.

Because of fine sludge produced by abrasives, grinders present a different problem. It often becomes necessary to go to great lengths in separating grit from the coolant to obtain longer wheel life, or better finish and precision.

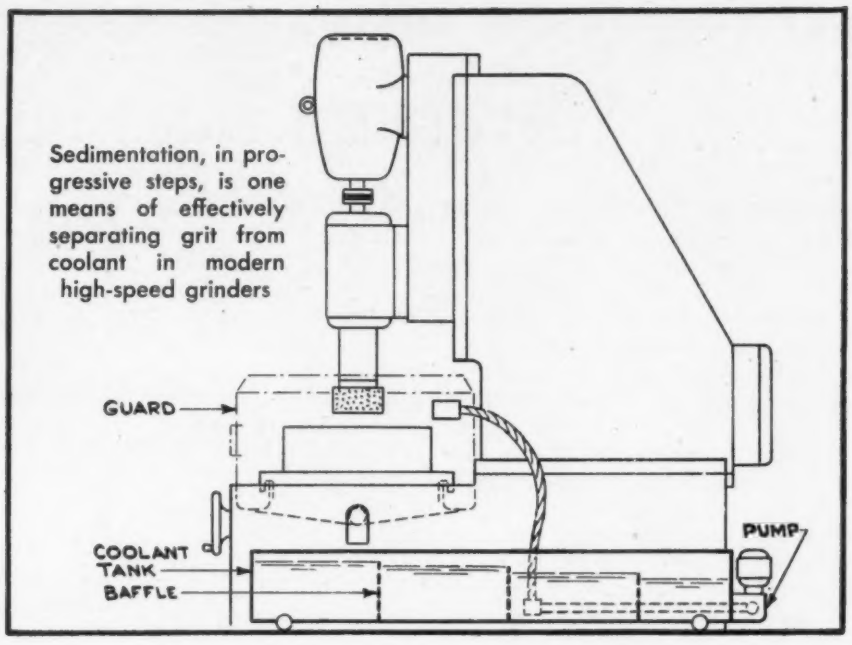
Production capacity of grinders has been stepped up during the war and a comparatively troublesome coolant problem has arisen. Whatever the type of grinding, a generous supply of coolant at the right point is necessary. Where considerable heat is generated, flood lubrication must be applied to dissipate the heat and prevent localized distortion of, or changes in, the crystalline structure of the material.

Only the simplest means were provided for supplying a flow of coolant at the wheel in many previous types of grinders. Now such elements as screen and cloth filters, settling tanks with baffle arrangements, coil-spring filters or centrifugal separa-

tors of more complicated design must be considered.

An arrangement of coolant supply for a grinder is shown here, in which the sludge is separated from the coolant by sedimentation in several stages along the path of flow before being recirculated to its last point of application. This is satisfactory for conventional grinding

Any questions in connection with splash guards and local shielding of the work are excluded in this discussion, as they do not usually present difficulty to the machine designer who is willing to accept them rationally and be guided by functional requirements rather than by considerations of styling.



Sedimentation, in progressive steps, is one means of effectively separating grit from coolant in modern high-speed grinders

TIPS for Top Shop Men

125 Keep your eyes open for ways to help the physically handicapped, particularly discharged service men. Every shop has jobs they can do. If you help them without being obvious, the handicapped one will come to feel he can pull his share of the load. But grouse and fuss about him, hold him up to ridicule or make him appear inadequate and you'll kill his spirit and make other men ashamed of themselves—and of you.

126 There's an old saying, "There's nothing new under the sun." Most ideas are simply variations of older ones and most "new" problems are solved by such variations. Your job is to build a background of tricks of your trade, so you can try them out, one after another, when the new headache comes up. An old idea in new clothes may be your answer or may give somebody else the necessary spark.

127 Easy does it in human relationships. You can drive men just so far before you reach the limit any given man can be driven. Remember that old saying, "You can catch more flies with honey than with vinegar." Build "gang" spirit for the job and you'll get results.

128 By the same token, medical records are vital factors in pairing worker and job. The safety factor may be slimmer than even the worker guesses, and the responsibility is yours if he is hurt.

Slashing Aircraft-engine Costs

PRIVATE plane engines are going to require the closest of cooperation between design and production engineers if costs are to be reduced enough to get the volume of plane production desired.

Carl T. Doman, Aircooled Motors, Inc., cites some typical economies obtained by design-production cooperation. Crankshaft machining time on SAE 4340 steel was reduced from 14 to 3.8 manhours. An aluminum cylinder with cast-iron liner costs half as much as a forged steel barrel, single cast aluminum head and aluminum cooling muff.

Automotive practice of using different materials for intake and exhaust valves is another great saving. Stellite valve faces increase valve cost 200%. Two-piece exhaust valves, stainless head and SAE 3140 stem give excellent results. Cast-iron valve seats shrunk (0.004 in. tight) work perfectly as do honed cast-iron valve guides instead of bronze or stainless steel, and the cost is one-third as much.

Cast iron instead of forged shafts cost only a few cents more in the rough but cost only about 40 percent as much when finished. Stamped steel valve rocker-arm parts, hydrogen brazed, with a steel bushing as a structural member, cut the cost of these parts 75%. Stamped steel valve covers replaced die-cast covers, eliminating corrosion and reducing cost 70%.

A substantial saving was obtained by using sintered iron oil-pump gears such as have been used in millions of auto engines instead of cut steel. A pressed-steel oil pan replaced the magnesium one used during the war. The latter cost $14 in the rough plus two manhours machine time; the former comes into the shop finished for $3.50.

The oil cooler built to AN standards has been replaced by a finned-tube type costing one-third as much. A gear cover, formerly a magnesium casting costing $22, is now made of pressed steel and costs 32 cents in the rough.

Many designers are reluctant to use stamped parts because they fear tool cost will be excessive in limited runs. That may be erroneous because a stamping usually saves weight, saves on piece price, and reduces tooling.

For example, a timing-gear case set of dies cost $7,505 from which the piece cost 33 cents. The magnesium casting which it replaced had a metal pattern cost of $3,175 plus fixture-design time amounting to $1,750, plus machining fixtures of $2,200 and a tool tryout of $500, or a total of $7,625. The magnesium casting cost $2.60 plus 35 min. labor, or more than 10 times as much as the stamping. An oil pan offers a similar example. Dies cost $5,200 with piece price at $3.50 while magnesium pans required $19,200 in patterns and fixtures, plus material cost at 90 cents per lb.

Electronic Rectifier Equipment

BEFORE ELECTRONIC RECTIFIERS came into use, motor-generators were practically the only source of dc. power. Today, however, many of industry's requirements are met by electronic rectifiers, ranging all the way from one watt to many million watts in power-handling ability.

Rectifier tubes of many sizes and characteristics are used to meet a wide range of requirements. The kenotron, for example, a vacuum tube with a heated cathode, is ideally suited where a high-voltage, low-current rectifier is needed.

The phanotron, the smallest of the gas-filled tubes, is a moderate-current, low-power-loss rectifier. It takes care of the medium power requirements. The sealed ignitron, the pumped ignitron, and the multi-anode tank rectifiers are used for larce dc. power requirements.

Electronic rectifier equipments put these electronic tubes to work in a variety of circuits and in combinations with other equipment, depending on the specific application.

After selecting the type of tube according to the power requirements, the next requirement to be determined is whether or not a pulsating direct current, taken from the output of the rectifier tube, can be used. The application may require a more uniform dc. current such as is provided by a filter system, consisting of a combination of capacitance and inductance.

Examples of the two extreme requirements are the simplest battery charger, and, at the other extreme, the photoelectric amplifier. Batteries can be charged by an intermittent, pulsating current, while the photoelectric amplifier requires the smooth dc. provided by a filter system.

However, where dc. power requirements are high, filter systems are not economical to use. Instead, the equipment is designed so that the high-power rectifier is operated from a multiphase source of ac. This provides a comparatively smooth dc. at the output of the rectifier at a high power level.

The kenotron, like all rectifiers, permits electrons to flow in one direction only, from cathode to anode. This property of one-way flow provides a simple means of rectifying alternating current into direct current. To illustrate, the kenotron is hooked up in a circuit, with an ac. voltage supplied through a transformer to obtain the desired secondary voltage. It is assumed that the cathode is properly heated, so for simplicity the heater and its power supply are omitted.

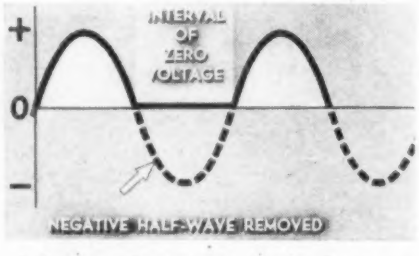
In this circuit, when the ac. supply produces a positive half-wave of voltage at the anode, the tube conducts. Electrons flow from the negative cathode to the positive anode, and on through the transformer secondary and load circuit.

On the other hand, during the negative cycle of the ac. voltage, the tube is non-conducting—because a negative anode does not attract electrons. As a result, one-tube rectifiers of this type are called "half-wave rectifiers."

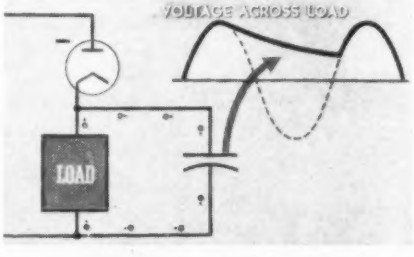
This type of circuit is used in high-voltage cable-testing devices, where the intermittent half-waves of dc. power are adequate.

Although a full wave of ac. voltage is applied to the rectifier, only the positive ac. cycles are allowed to go through. These positive half-waves emerge as pulsating half-waves of dc.

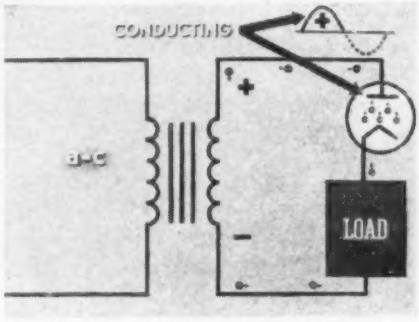
A closeup of this rectifier output indicates that every positive loop is



Pulsating dc. output results from removal of the negative half waves



A capacitor in the dc. circuit tends to level off the voltage



This rectifier uses a kenotron in a circuit supplied through a transformer

followed by an interval of zero voltage, occuring at the time of the negative loop of the ac. input. The negative half-waves are removed, giving a pulsating dc. output that has only limited application.

One way to reduce this voltage pulsation is to place a capacitor across the outgoing dc. circuit. A capacitor stores energy as the result of voltage applied. Therefore, when a capacitor is connected across the output of the rectifier, the capacitor stores energy on the positive rise of voltage across the load until the point is reached at the top of the voltage curve where the voltage starts to drop. Then, the capacitor releases this stored energy into the load, thus supplying some voltage across the load when the tube is not conducting.

This process repeats itself each cycle, smoothing or leveling off the dc. voltage ripple applied to the load. Although this load voltage still pulsates somewhat, many applications find this amount of ripple permissible.

This simple rectifier can be applied to the electronic precipitator that recovers fine fly-ash from smoke stacks. Here the addition of a capacitor to the half-wave rectifier gives a direct current sufficiently constant to maintain the necessary electrostatic charge.

The same circuit is used in the radio receiver where the rectifier detector tube converts ac. into a varying dc. voltage that can be amplified to room volume.

Based on a sound slidefilm in the General Electric industrial electronics course.

Practical Ideas

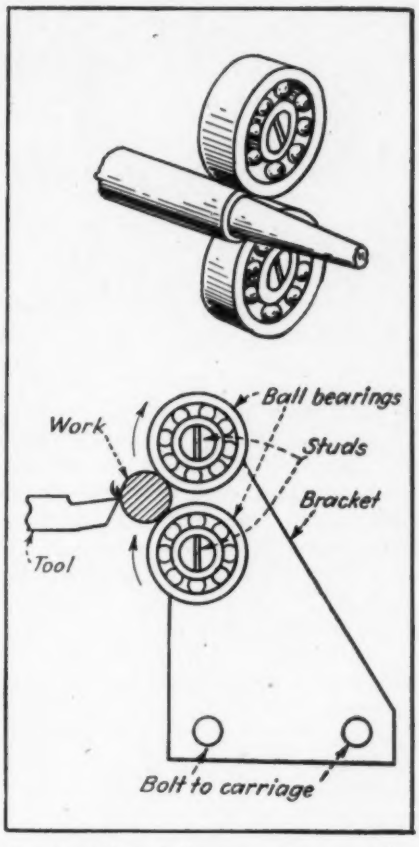
Roller Follow-rests Permit Heavy Cuts in Slender Shaft Turning

JAMES TAYLOR

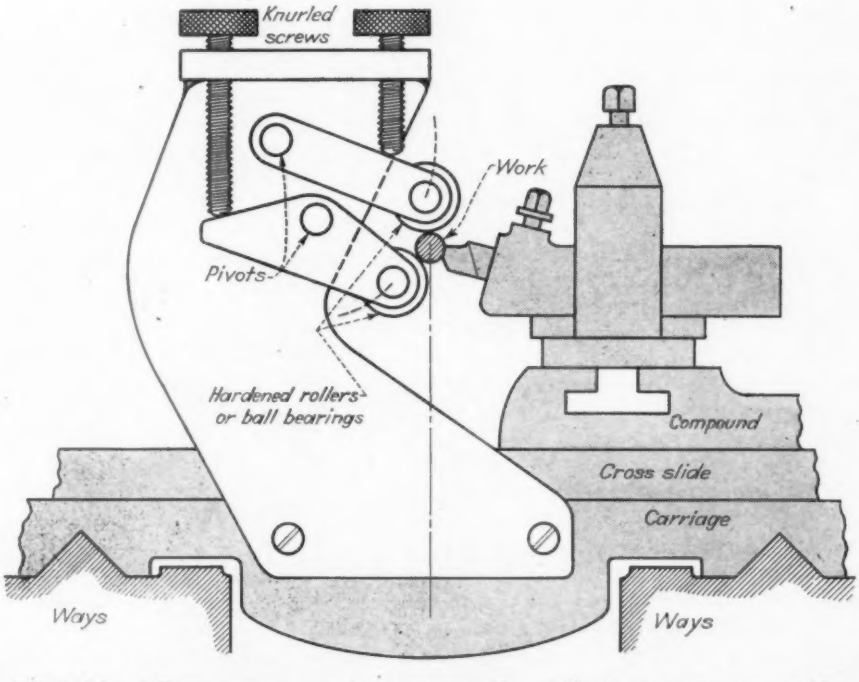
Taper and step-turning of small shafts, either singly or in high production can be speeded with the application of a roller or ball bearing follower rest. Mounted just ahead of the tool where the bar stock is uncut as yet, and its diameter therefore uniform, the anti-friction rolling contact will support any cut the tool can stand without danger of wear or overheating due to the rest. There is no backing off for a free running fit, or fussing with paper shims or other makeshifts; the rollers are in positive, solid contact, assuring as perfect straightness as the measuring and indicating instruments can register.

Two typical designs are shown, but these are merely illustrative. Individual machines or fixtures will dictate variations to suit the specific job. If the rest is rigid (without C-to-C roller adjustment) the rollers should be exactly in line vertically and centered above and below the work centerline. Then, the rest can be bolted to the cross-slide and adjusted against the work with the cross-feed screw while the tool is controlled with the compound rest. If a taper attachment or profiling device is used, requiring feed by means of the cross-slide, the rest will have to be bolted to the carriage itself and a separate adjustment provided.

If a wide range of work is anticipated, it may be worthwhile to make the rollers independently adjustable; then the rest can be bolted rigidly to the carriage, and the cross-slide will be free for tool feeding. This version has two knurled screws on top of the bracket each of which moves its roller arm inward as it screws down. The bracket and arms can be cut from ¼-in. plate so its construction is fairly simple.



Fixed roller follower rest provides strong, low-friction support for high-speed turning of long shafts

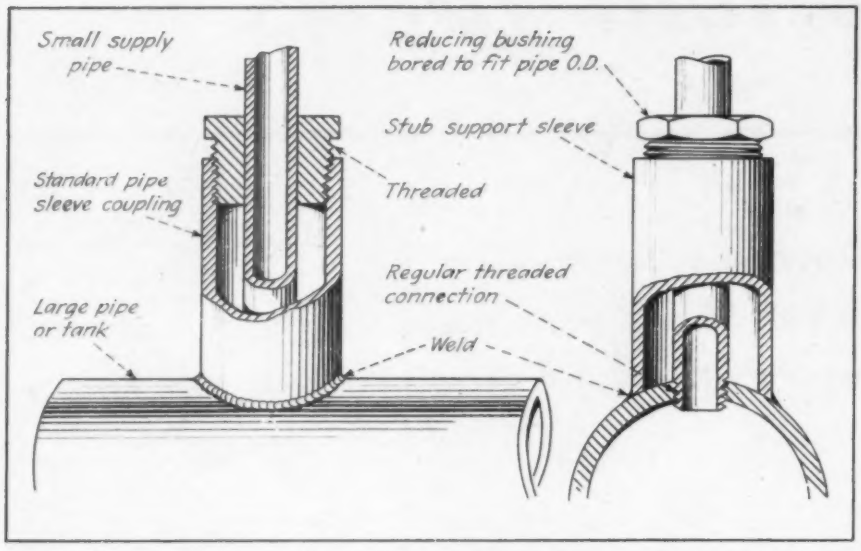


Adjustable follower rest permits taper and profile-turning over a wide diameter range

Reinforcement Prevents Breakage At Pipe-Tank Connections

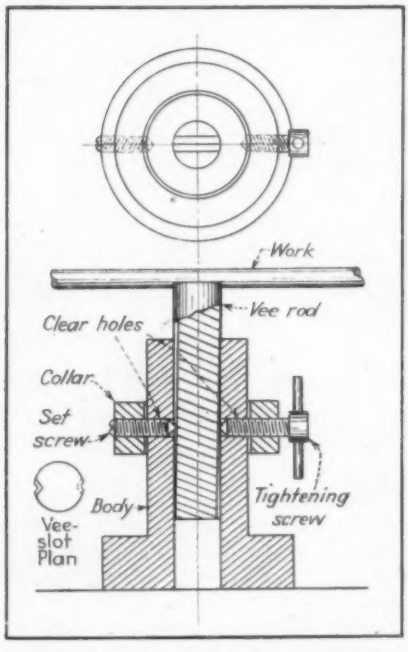
H. W. SHEPHERD

A favorite place for pipe to break is where it screws into tanks, air reservoirs, larger pipes or cylinders in vibrating machinery. Pipe nipples snap off at the threads flush with the surface they screw into. The threaded portion of the pipe is inherently weak and vibration does the rest of the ultimate damage.



Welded-on stub pipe and split bushing makes a strong vibration-proof joint reinforcement

To make this reinforcement, remove the pipe from its tapped hole temporarily. Weld a short section of pipe about three times as large, around and concentric with the hole. Split a standard bushing longtitudinally and bore it to a slip fit on the pipe to be reinforced and tap the large pipe to receive the bushing. Slip the bushing over the pipe and screw it back in place. Screw the bushing into the large pipe. As it tightens down on the taper thread it will grip the inner pipe tighter and tighter and stresses will be spread.



No-slip milling machine support works on a principle of opposing tapers

Sensitive "Jack" Supports Thin Rods For Splining

H. MOORE

When cutting splines along thin rods held between centers in the milling machine it is necessary to support them in the middle to prevent sagging under the cut. The screw jack is hardly convenient here because it is difficult to tell whether it is lifting the rod or not, and the plain support, tightened by a screw on the side, often drops imperceptibly while being tightened. The ideal support would be one in which the tightening screw enters a dimple corresponding to the correct height for any diameter of work. This design provides all the advantages of that ideal.

The dimple effect is achieved by slotting opposite sides of the support rod with tapered V's, with one taper running up and the other down. When the tightening screw is brought in on one side it tends to lift the rod, but the opposing screw, which feeds in simultaneously, tends to lower the rod by an equal amount so the total result is a locking effect.

The body is reamed to a slide fit for the V-rod and turned to a loose fit for the collar. Two clear holes in the body permit entrance of the tightening screws which are tapped in the floating collar.

One of these screws is a plain setscrew and the other has a handle. With the setscrew in the proper position, the other screw, pushing against the support rod will draw the collar and setscrew in on the other side until both screws bite on the rod.

Triangular Button Gage Checks Many Angles

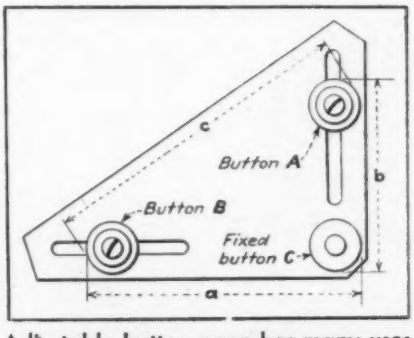
OSCAR CRAFT

Recently I had to check an instrument with a right angle and a 45° angle. After mulling over the problem awhile, I got a bright idea and went ahead and made this device which has since been used to check many instruments.

One toolmaker's button is permanently mounted in the corner of a triangular tool-steel plate which has slots cut along the legs. Two more toolmaker's buttons fit, one in each slot and have screws for tightening in position. The slots are wide enough to permit considerable side play, as it would be too difficult to count on them for really precision guiding anyway.

With button A all the way out at the end of its slot and button B all the way in, an angle of approximately 45° is obtained. Careful Jo block measurements make the final adjustments and you have a 90-45-45 triangle. With button A all the way in (and touching button C) and button B all the way out, the angle can be made very small, depending on the button diameters, and size of the plate and length of slots.

The instrument can be set up with any of a variety of tools and can be used for many purposes. Accurate outside or inside micrometers, vernier height gages and Jo blocks are typical setting up tools: their application can be visualized easily. Once set up, it can be used on many inspection jobs where other tools would fail, or be very hard to manage. Its compactness and simplicity should recommend it strongly as a



Adjustable button gage has many uses in checking angles

worthwhile addition to many toolkits.

In an emergency it can be used as a snap gage for "Go and Not Go" measurements over a wide range.

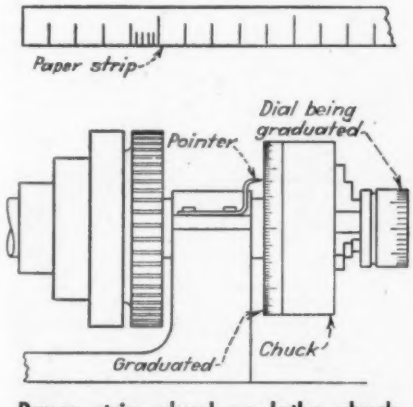
Paper Strip Calibrates Micrometer Dials

CONRAD ROGERS

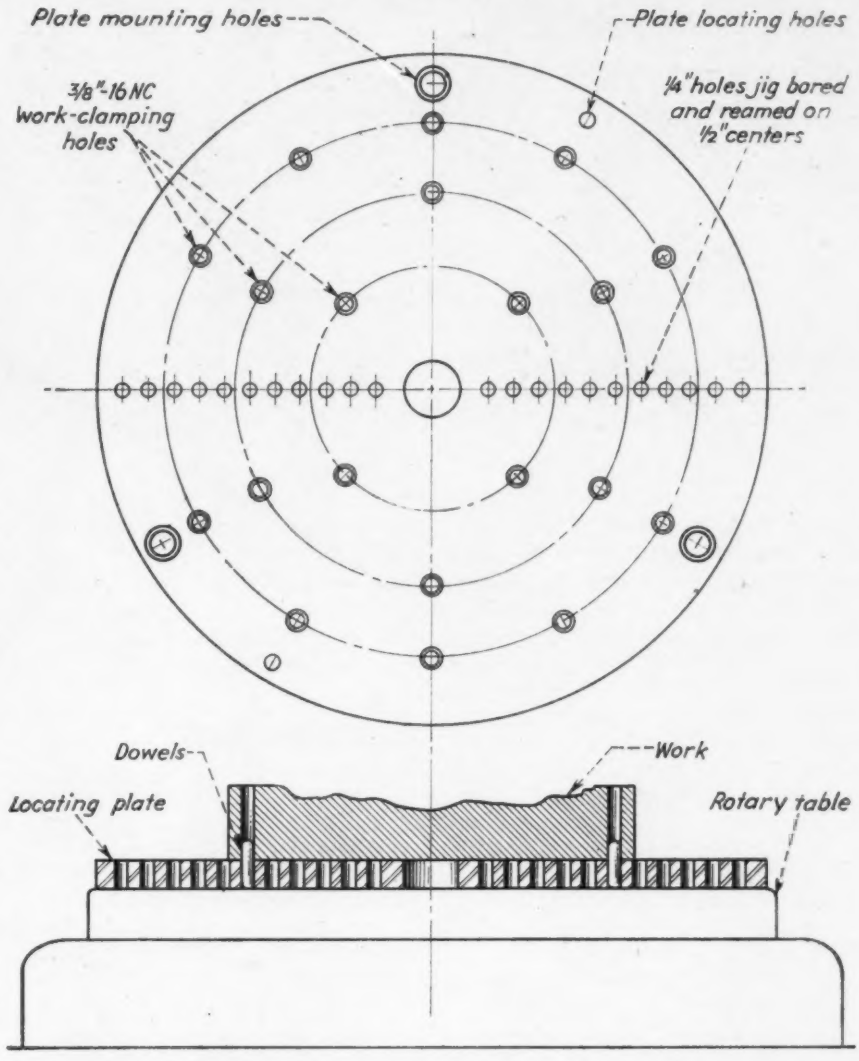
Some lathes are equipped with a micrometer dial on the cross feed screw but not on the compound rest. Some shapers have a dial on the cross feed but not on the vertical feed. Some machines have no dials at all. Dials that work well are not only very useful but a great source of satisfaction as well. Here is a way to make dials which requires only a plain lathe with no special attachments.

A piece of good paper 1 in. wide was wrapped around a 10-in. lathe chuck and marked to get the circumference, then removed and placed on a drawing board. As the feedscrew for which the dial was to be made had 8 threads per in., 125 divisions were required to make each division represent 0.001 in. feed. The paper strip was then divided first into five equal parts, then each of these into five parts (total: 25), and finally into five parts again (total: 125). This strip is now glued on the lathe chuck and a pointer arranged on the headstock to give a reference.

Using a stop to insure uniform line lengths, cut the five long lines first; adjust the stop and cut the next twenty; adjust the stop again and cut the 100 short lines. Remove the piece and mandrel and punch the numbers. Replace on centers and lightly file the dial as it rotates to remove burrs, and then polish with emery cloth and a buffing wheel.



Paper strip glued on lathe chuck makes possible the cutting of any number of graduations for micrometer dials



This plate, semi-permanently mounted on a particular machine, provides a system of locating holes to reposition work at any time, and plenty of tapped holes to suit different clamping requirements

Relocating Plate Shortens Setup Time

RICHARD G. GROWE

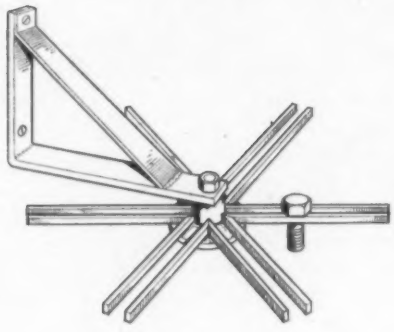
All mass production jobs are done with the aid of precision fixtures which include locating devices of some kind, insuring interchangeability of the finished parts.

Naturally, it's uneconomical to have such equipment for small jobs, to say nothing of a 1-piece job, but all too often, partly-finished work may have to be removed to make way for something else, and then be relocated when there is time to work on it again. Here is a universal locating fixture which makes it possible to locate a piece once and for all. If the unit should even be sent back for rework or repair, it can still be relocated exactly as when it was made.

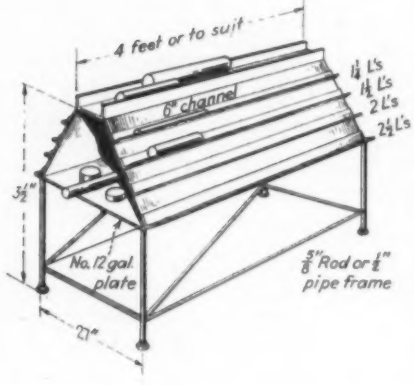
The plate itself must be designed for the particular machine in question, whether it's lathe, miller or jig-borer. Two lines of ¼-in. holes at right angles, 1 in. apart across the plate provide for locating any work by drilling any two, three or four convenient holes of the same size to match corresponding holes in the plate. As the plate holes are 1 in. apart and two lines are at right angles, the work can be jig-bored easily. Short dowels do the guiding, and other tapped holes are provided to get good clamping.

Hints on Small Tools

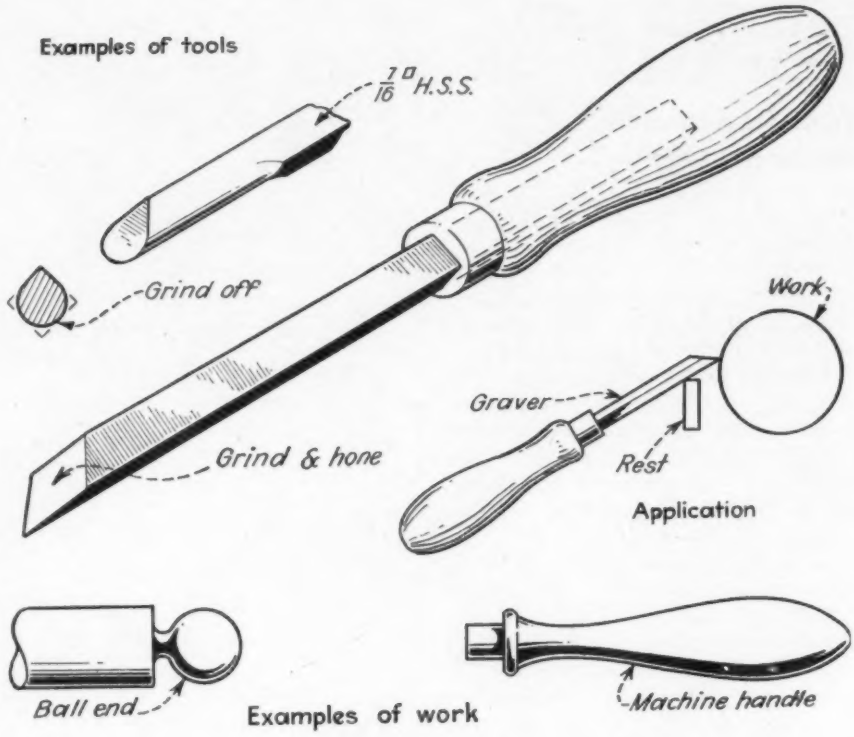
EARL R. GODDARD



Bolt Rack—A compact turntable bolt rack that will hold a good many bolts was made as shown. This particular rack was made for ⅝-in. bolts, that being the size used on our drillpress, milling machine and lathes. The rod is sloped upward so there will be no chance of bolts sliding out. The rack can be fastened to a column, wall, tool locker, or to end of bench by changing brackets.



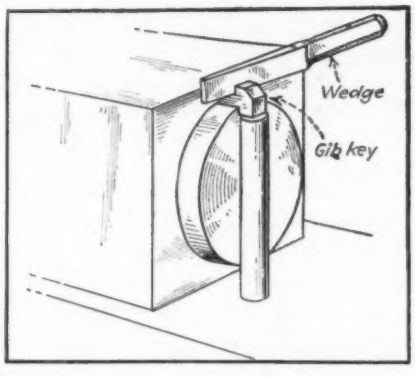
Material Rack—Odds and ends of bar stock can be laid out according to size and length in the angle-iron troughs of this all-welded rack, thus making the scrap pile into a valuable, time saving small parts storage unit. Now, people will find it more convenient to select a piece nearest to the needed size instead of hauling a long and heavy piece of stock to the saw. Four or more angles may be put on each side and the builder may prefer an angle of 45° to 30°. The plate may be omitted or placed on lower bracing, as desired. The rack should be fastened to the wall or floor for safety.

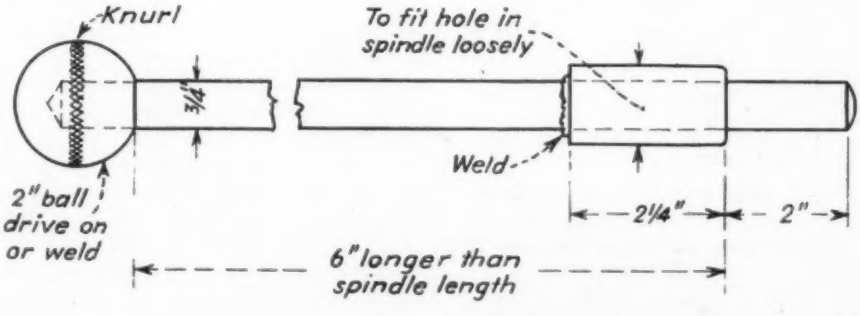


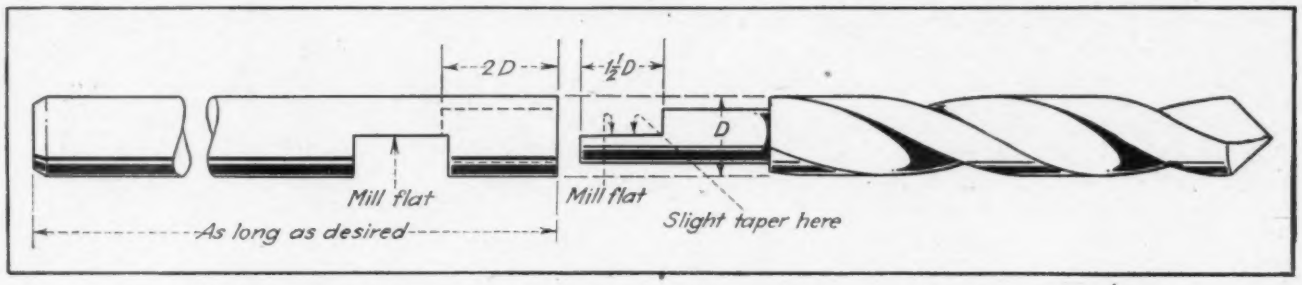
Machinist's Gravers—It is hard to turn fillets or irregular curved surfaces on metal with a single-point or even a formed-radius tool without leaving "bumps." These hand chisels, used just like a wood-turning chisel, do the work very nicely, leaving a good finish. Work should be roughed close to the final shape leaving only a little for the graver because it's just a shaving tool and not meant for heavy cuts.

Lathe Center Knockout Rod—The addition of a sleeve bushing on this knockout makes it possible to remove centers and any bushings independently. For different combinations of work, slip-on bushings of any O.D. can be added to the rod ahead of the guide sleeve to separate even very thin tubes.

Gib Key Wedge — We've all seen gib keys badly bent and burred due to improper removing. This wedge, tapered across the blade as well as lengthwise, concentrates its force low, reducing the bending tendency —and the likelihood of its jumping out. Support under the key further improves the operation.







Slight taper on the bayonet sides gives a wedging action to lock the tool in place

Bayonet Joint for Drill, Tap and Reamer Extensions

I. DIAMOND

On deep-hole jobs requiring drilling, reaming, tapping and counterboring, it may be easier to make one extension rod to accommodate each cutting tool in turn, instead of buying or making a whole set of long-shank tools.

This bayonet-joint method is easy to work out and it makes a coupling which doesn't increase the diameter at all, a "must" for many such jobs.

A hole is drilled and reamed into the extension to a depth approximately two or three times the diameter of the tool that is to be set in. A slot is then milled in the extension starting at a point about ⅛ in. before the end of the reamed hole. This slot width should be equal to about 1½ times the diameter of the inserted tool shank. This slot is milled down to the center-line of the extension holder.

The tool to be inserted is prepared by turning down a smaller diameter for a slip fit into the holder. The turned down portion should be about ⅛ in. short of the end of the shank slot when the tool is in full engagement. A flat is milled on the upper portion of this shank on a two or three degree taper down to the centerline of the tool.

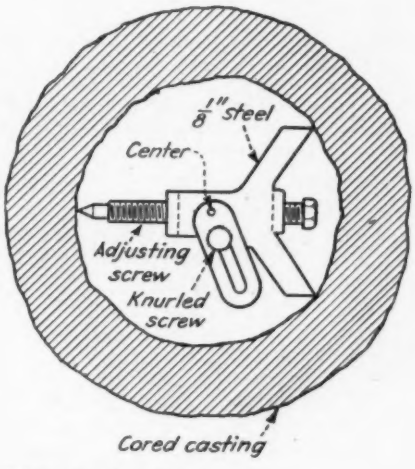
In operation, the turned-down portion of the tool is kept centered by bearing in the reamed hole in the extension, and thrust is taken by the shoulder bearing against the extension holder. The tool is driven by the flatted shank bearing on the flat of the slot in the extension holder, and the slightly-tapered flat on the tool shank wedges it tightly.

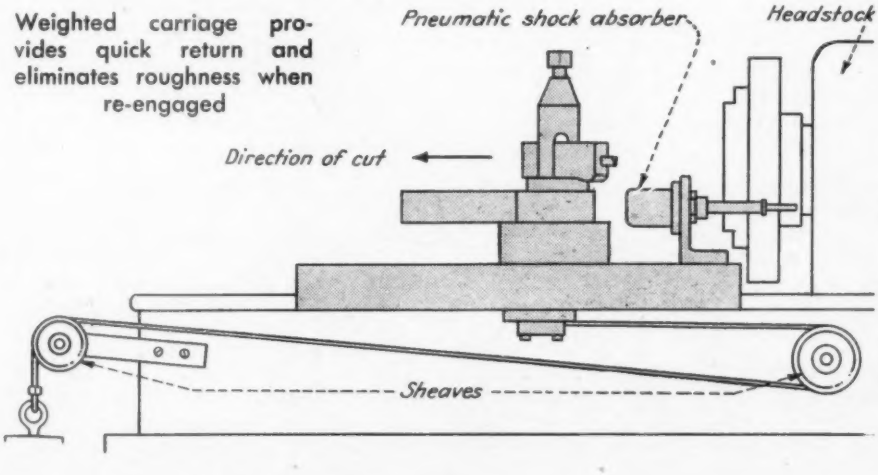
Rapid Return Mechanism Speeds Thread Cutting

ROBERT T. PLITT
Navy Yard, Washington

For production thread cutting, this device quickly brings the lathe carriage smoothly up to a positive stop whenever the half-nuts are disengaged. This particular lathe is cutting left-hand threads so the feed is toward the tailstock and an upside down tool is used. The weight, cable and pulleys are arranged to maintain a constant pressure on the carriage toward the headstock at any position and a pneumatic checking cylinder (like a door check) absorbs the momentum and stops the carriage gradually at the exact spot for the next cut without shock.

The positive stop assures accurate location and the weight steadies the carriage and eliminates backlash. Before this was adopted, engaging the nuts with the spindle turning at 273 RPM caused a jump which produced an uneven thread or two and sometimes damaged the tools. *Suggestion submitted under the Navy Employees' Suggestion Program.*





Weighted carriage provides quick return and eliminates roughness when re-engaged

False Center For Laying Out Castings

LEE L. DODDS

Most machinists have had the irritating experience of improvising a false center when laying out a casting with a cored hole. The commonly accepted device is a stick tightly fitted in the hole with a piece of copper or tin tacked in place near the center. The writer, in his long life, has spent many hours at the layout table, and finally decided to do something about it.

The result was this false center. It is made from hardened ⅛-in.

tool-steel plate. It may be made in various sizes, to fit different size holes. After insertion in the cored hole, it is only necessary to shift the slotted center-bar around, using a pair of dividers, until the approximate center is found. This will be found to be surprisingly rapid and the whole operation will consume less time than would be spent in looking for a stick. If a number of castings are to be laid out, it will be found that little, or no shifting of the center-bar is necessary.

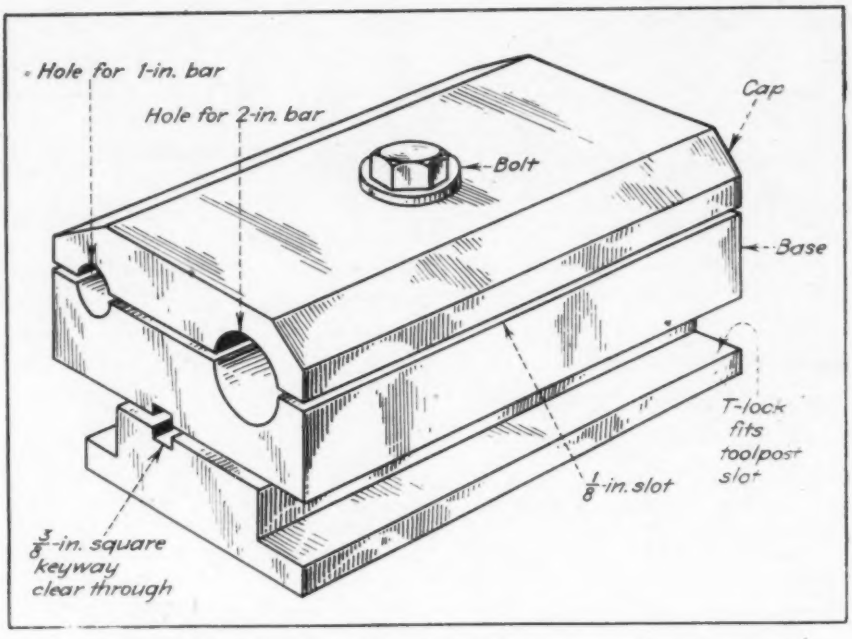
Boring Bar Holder Takes Two Sizes

WILLIAM NEWTON

Here's an easy way to make a boring bar holder which can be turned end for end so either size boring bar will be on side toward the work. The "nut" is a long piece which fits the T-slot in the compound, and a square keyway the full length of its upper surface provides for locking the holder when angular adjustments are to be made with the compound rest itself.

The holder is made in two halves. Clamp these together with a ⅛-in. spacer between and drill and ream the two holes according to your two most frequently used boring bar sizes. Drill the vertical hole for the locking bolt clear through. For convenience, you can use a bolt with the same head size as the tailstock locking bolt so the same wrench will fit, or to cut down height, use a large hollow-socket capscrew which will fit flush.

This holder can be used somewhat like a turret. To insure even clamping, both holes will have to be filled anyway, so it's just as easy to keep boring bars in both holes, one projecting from each end. Then, when the roughing cut is completed with the large bar, pull out the keys, turn the holder 180°, put back the keys, and the finishing tool is right in position.



Symmetrical double boring bar holder can be used as a turret

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Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Twelfth Selection—S. C. Carty on Reboring Valve Seats

Check Chart for Turning Stainless Steels

THE ACCOMPANYING TABLE shows the high and low range of speeds and feeds for turning stainless steels—in hot-rolled, cold-drawn and centerless ground condition, and in hardness ranging from 187 to 250 Brinell. Dead-soft material in tough and draggy. Therefore, all stainless steels will machine better if used in slightly harder than the dead-soft annealed condition. Tools with 5 to 10° top rake will generate less heat and be freer cutting. Use finishing cuts for close-tolerance work. It is good practice to turn to 0.003 to 0.005 in. of finished size and then finish with a light cut at a fairly fast speed.

In the table, the first six types contain less than 12.5% chromium, the next four contain more than 12.5% chromium and the last two have at least 24% chromium. The grades easiest to machine are Types 416, 420F and 430F.

Speeds and Feeds for Turning

Type No.	Sfpm.	Feed per rev., In.
410	80 to 115	0.003 to 0.008
420	40 to 80	0.003 to 0.008
420F	80 to 110	0.003 to 0.008
440	40 to 60	0.003 to 0.008
440F	70 to 90	0.003 to 0.008
416	110 to 140	0.003 to 0.008
443	80 to 110	0.003 to 0.008
430	85 to 115	0.003 to 0.008
430F	120 to 150	0.003 to 0.008
329	60 to 80	0.003 to 0.008
302	40 to 85	0.003 to 0.008
303	85 to 120	0.003 to 0.008

No. 1—TURNING CHECK CHART

TROUBLE	CORRECTION
Cannot take finish cut close enough for threading	Stock too soft or cut too heavy. Add shaving operation, taking a light fast finishing cut (0.005 to 0.008 in.) Experienced operators are doing this and eliminating grinding before thread cutting for Class 3 fits.
Tools burn	Lubricant may be too thin. Add more sulphur base oil. Spindle speed too high. Check with table. Material too hard for type of turning tool being used.
Excessive tool wear	Generally an indication of too rich a mixture of sulphur base oil. Add paraffin oil until excessive wear is reduced.
Tools won't hold edge	After worn edges are removed with 60-grit wheel, it is desirable to finish with a 120-grit wheel and stone the edges. Following these recommendations has generally increased tool life from 10 to 60%.
Tool cuts undersize after grinding	Look for a "bug" on cutting edge. Sometimes a small one remains after grinding. This starts building up metal right away, resulting in undersized cut. Stoning after grinding will eliminate this. Mechanical adjustment of machine may be required.
Chatter marks	Tool is not being held tight in fixture, causing vibration. Tool is not properly set with centerline of work. Excessive clearance angles tend to cause chatter. Too heavy a cut or too light a machine. A roller steadyrest will help to prevent chattering.
Tool heats excessively and finish is rough	Not enough clearance angle. Tool rubbing against work creating friction heat. This requires more pressure to feed tool and the rubbing causes poor finish.
Double chips	This occurs when tool has chip groove which is carried through the front of tool or cutter. This can be overcome by proper regrinding.

NO. 2—TURNING CHECK CHART

TROUBLE	CORRECTION
Tool heats badly	Is tool heavy enough? Does it have enough mass to carry off generated heat? Check lubricant as it might be too rich in sulphur base oil and should be cut back with a coolant such as paraffin base oil.
Cutting edge breaks off	Tool ground with too coarse a grinding wheel. Not enough mechanical support due to grinding large concavity in front clearance. Use straight angular grind with minimum front clearance, usually between 7° and 10°.
Chips pile on top of tool	Top rake angle not steep enough. Should be 5° to 10°. Also indicates need of "chip curler." If curler is used, it is not deep and wide enough. Stoning top rake to a fine smoothness helps chips slide off.
Work cuts with taper	Rough turn to 0.003 to .005 in. of finished size and shave, using light cut at a fast speed. Check lubricant to be sure mixture has enough paraffin oil to serve as coolant for dissipating heat.
Poor or rough finish	Check cutting tool. If ground on coarse-grit wheel and not stoned, this is natural result. Cut may be too heavy. Stock may be too soft, and is "picking up."
Cannot hold close tolerance	Close tolerances are not readily obtainable on heavy cuts. Machine to 0.003 to 0.005 in. of finished size and tolerance required and then take a shave or finishing cut with fairly fast speed. Have lubricant on thin side for cooling purposes.
Tool "rides" work	Tool not sharp enough. Top rake angle not steep enough, causing "bugging." Look for "play or looseness" in machine or tool.
Work glazes or hardens	Tool either dull or riding too far above center of work. The use of a solid type steadyrest will glaze or work-harden job—change to roller-type steadyrest.
Tools "hog in"	Rake angles too small. Also check side clearance. Stock may be extra dead soft. Carriage may be loose. Cutting edge of tool below centerline.
Circular form tools gall and bind on sides	Cut too deep for side clearance allowed. Increase angle of side clearance. If this goes beyond allowable limits of finished piece, a shaving operation will have to be added.

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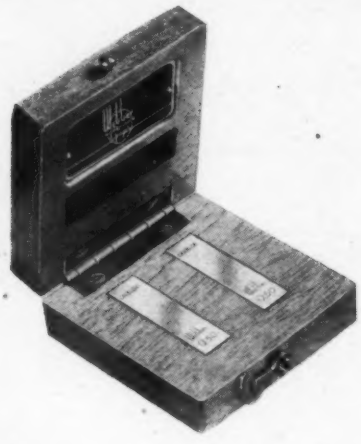

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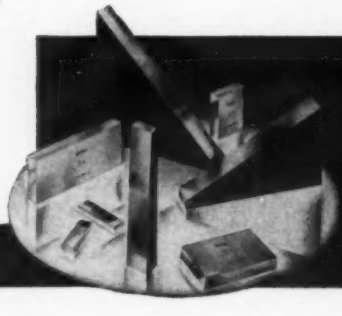

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GAGE BLOCKS

Check Chart for Tapping Stainless Steels

SPIRAL-FLUTE or spiral-pointed straight-flute taps are desirable, especially for the softer and non-free-machining types of alloys.

In tapping stainless, particularly fine pitches, select drill sizes with care. Check each job with the formula:

$$TD = D - \frac{0.0130 \times \%\ \text{thread}}{\text{Threads per in.}}$$

Where *TD* is tap drill dia., *D* is tap major diameter.

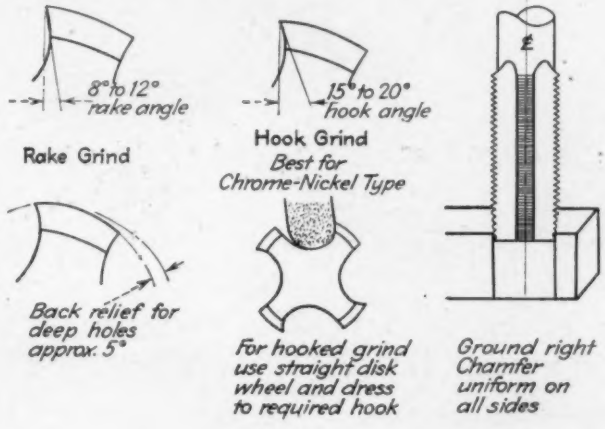
Use 100% thread engagement where metal thickness is one-half or less tap diameter; 75% for up to twice tap diemeter, 50% for greater thickness.

Tapping Speeds for Stainless Steels

Type No.	Sfpm.	Type No.	Sfpm.
410	10 to 25	302	10 to 20
420	10 to 20	416	15 to 35
420F	15 to 25	430	10 to 20
440	5 to 15	430F	15 to 40
440F	10 to 20	329	5 to 15
443	15 to 25	303	15 to 30

COURTESY OF CARPENTER STEEL COMPANY

REGRINDING TAPS


8° to 12° rake angle
15° to 20° hook angle
Rake Grind
Hook Grind
Best for Chrome-Nickel Type
Back relief for deep holes approx. 5°
For hooked grind use straight disk wheel and dress to required hook
Ground right Chamfer uniform on all sides

TAPPING CHECK CHART

TROUBLE	CORRECTION
Loose fits won't meet tolerance.	Two factors cause this trouble. First, oversized drill holes. Was drill selected from an old "standard table"? These tables have errors, particularly on fine pitches. Check drill size with formulas. Commercial ground taps cut Class 2 fits. Precision ground taps cut Class 3 and Class 4 fits.
Tapped holes not consistently accurate.	Usually due to tap holder taking slightly different angle each time. If you are using "floating" holder, check how much it wobbles. Often changing to an accurate, rigid holder overcomes this trouble. Check flutes; if shallow, chips will pack causing tap to cut oversize.
Tap overloading caused by pick-up.	Loading or pick-up on tap surfaces causes most tap breakage. To let it go means the pick-up will finally be so great that tap will weld in hole and power of machine will break it. Check lubrication. Other causes of loading are lands too wide, chips packing in flutes, or dull tap.
Roughness in threads.	If all other factors and variables have been carefully checked, try a negative grind on the heel of the tap. This overcomes tap tearing threads when backing out.
Broken teeth.	Tap may be too hard for type of material being cut. Grind broken teeth entirely away and tap will be serviceable.
Loading on stringy soft metals.	This can usually be overcome by polishing the tap after grinding. The better the tap is polished, the less tendency for loading.
Flutes require regrinding.	See sketches for correct method and grinding wheel shape.
Poor threads and high tap breakage.	Grind proper chamfer on end of tap.

TAPPING CHECK CHART

TROUBLE	CORRECTION
High power consumption and quick dulling of tap.	Chamfer ground even but point diameter too small throwing all the load of cutting on too small a portion of the chamfer. Check hardness of tap—may not be hard enough for type of material being cut.
Tap slows up. More power required.	Generally an indication of improperly ground or dull tap. Check hole diameter. *Drills* may have worn enough to be cutting undersized. Check to see if axis of hole and tap are parallel. Check for chips packing in flute. This can develop if flutes are shallow or lands too wide. Power required to break chip packing often more than required to tap. On deep holes this will break taps.
Tap cuts when backing out.	This is usually caused when tap cuts oversized hole, leaving no support for tap when backing out, thereby permitting it to cut. A "floating" tap holder or wobbly spindle contributes to this condition.
Tap runs hot, dulls too fast.	This invariably is due to tapping speed being too high. Check the table for recommended speed.
Tap drags badly.	Usually a sign of tapping speed being too low. Check table.
Lubrication.	General recommendation: three parts paraffin to one part sulphurized oil. As added precaution for tapping, check to make sure lubricant is flooding the tap constantly while it is in the hole. Be sure pressure of lubricant is strong enough to wash chips away.
Coolants.	Generally, tapping speeds are not fast enough to heat the tap. Therefore, coolants are not necessary. It is more important to use a good lubricant that will prevent wear and friction on the tap. It also reduces power required to cut.

can cause a drooping production curve

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NEWS OF METALWORKING

Relief from Strikes Sends Material Output Upward; 1947 Outlook Bright

WASHINGTON—War-emptied pipelines are filling rapidly with materials and producers' goods and the backsurge will become strong around new year. Beginning sometime in 1947 most producers will be able to get steel, most non-ferrous metals, and in many cases, enough manpower to make all the goods they can sell.

Steel has reached a new 1946 peak. Pig iron output is the highest since May, 1945. Domestic refined copper is up 37%. Brass mill work is at an all time high. Electric power lines never before carried today's loads. Automobiles are rolling at 3 million annual rate, and one million are expected in three months September-November.

Production Flood Rising

Three months of comparative relief from work stoppage has started the production flood and 5 or 6 months more will greatly narrow the gap between demand and supply.

When competition finally bears down on manufacturers' production schedule ceilings, industrial war mobilization, now a major backroom subject in Washington, may jack it up again at some points.

When the production ceiling shows, industry will exert more pressure against the free flow of war surplus, trucks, engines, planes, machine tools—all windfalls so long as supply is short of need.

Wages May Be Held

Believing the summit of inflation is in sight, because talk of a slump in 1947 is making people security-conscious, the Administration will try to hold the wage line by stalling off major increases, rather than revise and announce policy, which would re-open thousands of union contracts. Wage Stabilization Board is dead for practical purposes but OWMR will do the stalling. The real test will come in February when steel wages come up for renegotiation.

Some government economists say that significant expansion of production above present levels in most categories can be achieved only through sharp increase in labor productivity. Indifferent attitude of workers persists, but will improve as the union rampage subsides. However, efficiency mainly depends not on attitudes, but on availability of materials so that goods can be finished in one run; on conversion of facilities to postwar patterns; and on invention of still-better production techniques and devices: means by which industry has beat rising costs for generations.

Allocations Hit Steel

Serious, partly because it was unforeseen, is present diversion of iron and steel products to housing, mainly for veterans, whose political voltage is very high.

Steel will ease in the fourth quarter, but will still be tight. Steel production is at 88.3% of capacity; 6.9 million tons of steel ingot in August was a new peak; delivery of finished steel products rose 13% to 5.1 million tons. But bottlenecks in certain items, such as sheet and strip, tin mill goods, small bars, small shapes, are holding up production nearly as though there were no steel at all. The industry blames CPA for allocating almost the entire production of some items, shutting off many users from their sources of supply. Eighty-five percent of authorized tonnage is sheet and strip. Too much diversion to housing cannot help the veterans if it curtails other goods they need to put in the houses.

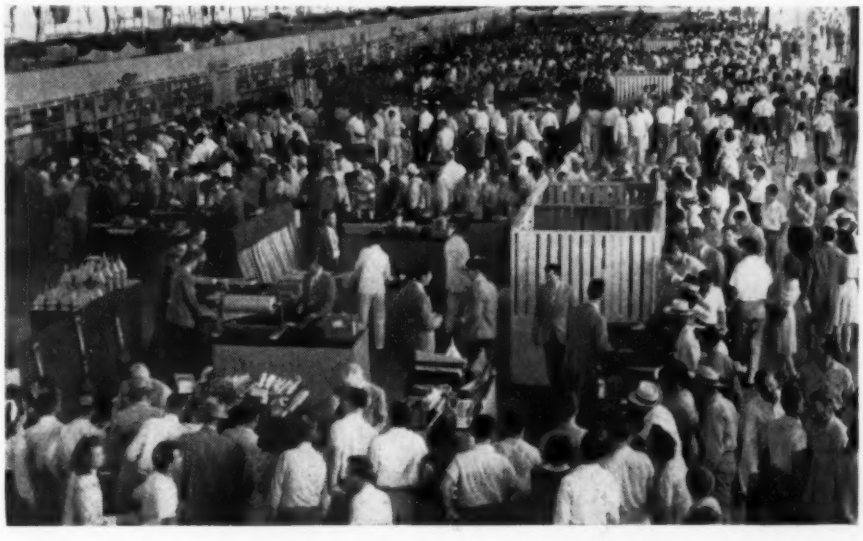
Transportation Bottleneck

Some manufacturers are easing up on production because transportation is inadequate to deliver it. But freight car building is up 40% in August to 5532 units, nearly all domestic types, as result of recovery from impact of steel and coal strikes. CPA hopes for 8000 per month in the last quarter, but knocking down the order backlog of 100,000 will run through 1947. Alleviating factor in the freight jam is motor truck production, up 13% in August to 105,500, a new peak.

Lead, Copper Situations

Difficulty of resuming operations after strikes, vacationing workers, and confusion on prices, have slowed lead production, which is only 90,000 tons in the 3rd quarter, will be 95,000 in the 4th. Rollback in price of secondary metal was a severe jolt, says CPA, which often disagrees with OPA. Increased imports in 4th quarter will be partly due to 10,000 tons found in Japan. In August and September supplies of primary lead were only 60% of authorized use.

Copper production rose 37% in August to 59,600 tons domestic refined. August deliveries to customers totaled 119,000 tons, of which 52,700 tons were from reserve stockpiles, which, by July 1, had dwindled to 215,000 tons.



WAA General Store For Surplus—This War Assets Administration general store is packed with veterans shown standing in lines to get waited on. The plan is said to feature a minimum of red tape and many hard-to-get items

Gaging Business

Production Schedules Cut

Industry is being more realistic about its nearterm production plans. This is reflected by scattered reports from different industries reflecting some cancellations of orders for steel and parts, deferment of expansion programs and a decline in advanced buying. Faced by an uneven flow of materials and components, which have only permitted operations in fits and starts, many industries have finally concluded that ambitious production schedules would have to be scaled down to more practical levels for the present.

Deferment of expansion plans in the auto industry, was accompanied by the cancellations of steel quotas by small makers of parts, and a declining interest of many manufactuers in placing orders for extended shipments of machinery, electrical equipment and so on.

Shortages of pig iron, steel, copper, lead, and fractional-hp. motors have been overcome by resourceful management policies, which have accounted for the high levels of durable goods output despite such difficulties. But the necessity for industry to lay in a working inventory of these various short items, the entry of hundreds of new firms into these manufacturing fields, and each firm's attempt to beat its competitors to market with finished goods have piled up a hopeless backlog on the books of their suppliers.

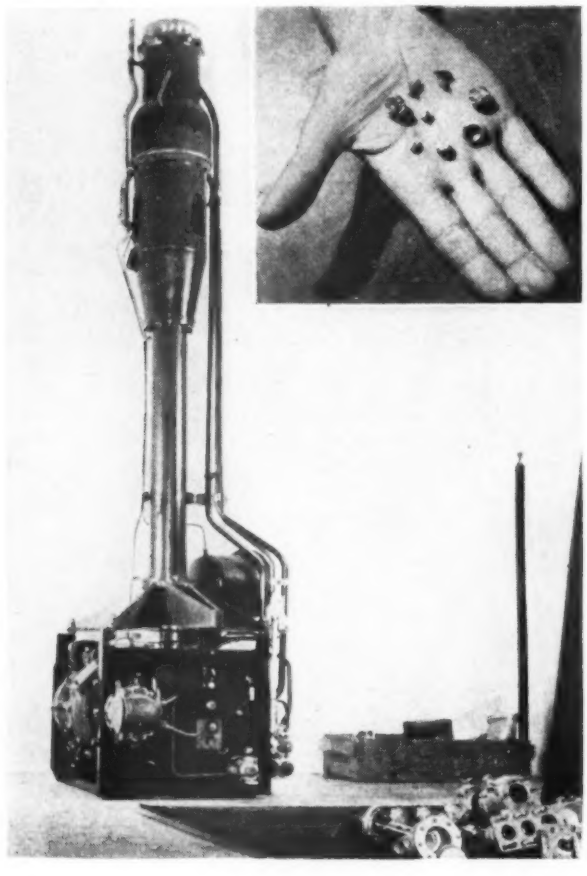
Thus, the gradual scaling down of orders and decline in flow of new purchasing should ease pressure for steel and other materials by early 1947.

Getting Material Sources

Aggressive manufacturers are now seeking to acquire their own source of raw materials and parts, just as the Kaiser-Frazer Company acquired a steel plant to be assured of steel deliveries. Small users of pig iron are contemplating the possibilities of pooling their resources to take over the operation of some idle government blast furnaces to assure them of pig iron supplies. Several big companies are planning to take over smaller plants upon which they depend for certain parts and components.

The operation of idle government-owned blast furnaces would improve the pig iron situation, but acquisition of other plants by leading customers would make things worse for some consumers. In any event, the materials situation is gradually being improved as surplus steel plants and rolling mills are put back into operation, new plastics-producing capacity becomes available, and supplies of non-ferrous metals are released from government stocks.

On the negative side is the disruption to materials flow caused by government allocations for housing, farm equipment, and railroad brake shoes, which in some cases bears much more heavily upon some steel plants and blast furnaces than on others. Moreover, a few priority plants are said to be getting larger allocations of materials than they can process. Meanwhile, prices continue to obstruct imports of nonferrous metals and the production of various items.



Navy Aerojet Power Plant—It would take a steam engine the size of a locomotive to generate the power developed by this relatively small liquid propellant rocket power plant. This assembly is a liquid bi-propellant jet engine being readied for static firing tests for the Navy. Small objects in the palm of a machinist in the inset are "spinners" which mix secret liquid fuels just before combustion

Equipment Buying Slumps

Less optimistic production programs are reflected in the low volume of equipment buying over recent weeks. Domestic machine tool orders have fallen off, except for some heavy buying by midwestern farm equipment companies. Business from other industries is spotty, and the fourth quarter outlook is not too promising. Some observers believe that the stock market drop may have had a sobering effect on equipment buyers.

Builders hope that business will pick up after the first of the year, since there are some potentially large orders in the offing. Some big customers have tested new machinery on pilot lines, expecting to place large orders later on, but this action has been deferred.

Foreign buying continues steady, with Finland, Sweden and Holland very active at present. The French are reported ready to spend $40,000,000 for machine tools here. Russia has not been active, and some observers believe this may be partly due to a pending agreement between Britain and Russia, which will involve sales of British equipment.

Machine Tool Operations

To maintain operations in their plants, some machine tool builders have taken on subcontracting work, making parts for printing presses, packaging machinery, plastics machinery, and mechanical presses. Ironically enough, some of the subcontract work is being done for former subcontractors of the builders.

Meanwhile, equipment shipments have suffered due to skilled labor shortages and bottlenecks in materials and parts. The materials and parts situation has been particularly bad. As an example, one firm that used to take 8-12 weeks to process an order through its plants, now requires 22 weeks, of which six are consumed in delays of castings.

Senate Military Affairs Committee Attacks Surplus Disposal Methods

WASHINGTON — Revised methods of selling cutting tools and machine tools through agencies appointed by War Assets Administration are proposed in a severely critical report from the Surplus Property Subcommittee of Senate Military Affairs Committee. The report covers the 4-agency disposal programs of WAA, including also electronics equipment and airplane parts.

Cutting Tools Hit

According to the committee, headed by Senator Joseph C. O'Mahoney (D) of Wyoming, only $453,000 worth of cutting tools had been sold as of June 28, for $187,000, out of $28,900,000 declared surplus, or about 2%. Report says potential surplus is about $40,000,000. Sales are handled by about 50 cutting tools manufacturers.

Only established manufacturers of cutting tools are appointed to sell surplus tools. They sell only surplus tools of their own manufacture, at the full market price. For those reasons, committee says, chances of selling many tools in this manner are negligible.

Present agreement form, the committee says, serves to entrench the established companies and to prevent entry of new concerns. By early last year department of justice told RFC, then heading surplus disposal, that the agreements contained monopolistic aspects.

Machine Tool Criticism

Criticism of machine tool dealer selling is much less severe. Report says that of $954,537,000 worth of tools declared surplus to June 28, about $257,000,000 worth, or 27%, had been sold for $123,403,000.

The Clayton Pricing Formula, which gages depreciation according to age of the machine, should be revised to handle equipment in bad condition, the committee says. It suggests also that there are too many agents in some regions; that commissions have been claimed by WAA personnel for agents who performed no service; that payment of commissions has been long delayed in some cases.

Spokesmen for machine tool manufacturers took exception to the committee's language calling the dealer a "Finder" of prospects. They said the committee ignores the dealers' valuable know-how and his services in checking vague descriptions of equipment, and in advising on requirements and installation.

Committee Recommendations

Summarizing its investigation of the four agency programs, the committee recommends extending agency agreement to other lines for better know-how, inspection, warehousing, reworking, and knowledge of specialized merchandise markets. In difficult-to-sell lines, higher commissions, and premiums for exceeding quotas, should be offered.

Midwest Studies Inventories; Advanced Buying Declining

CHICAGO — Forward commitments for both parts and materials and tools are under scrutiny by Chicago area metal working firms. While cancellations of advance orders thus far have been few, only a slight change in management attitude could precipitate a stampede of cancellations.

Inventories generally are large but badly unbalanced. While the large companies that were surveyed are able to carry the excess stocks of some parts without difficulty until the scarce parts are obtained, thereby achieving a balance, smaller concerns are in a more troublesome position.

It was reported that some small companies are in a difficult working capital position, and have tied up much of their cash in inventories. Banks, in turn, are scrutinizing requests for credit from these smaller companies very carefully.

Inventory Threats

While the inventory situation is not yet serious enough to cause cancellations of material orders, it could become so, according to plant executives, if any one of several things happen in the next month or two:

1. Renewed labor disputes, holding back already lagging production in some line. 2. A further break in the stock market, with consequent psychological effects as well as a tightening of capital markets. 3. Continued shortages of vital parts and materials. 4. Continued price increases.

Cancellations Deferred

Regarding the latter point one large manufacturer said that, if prices of tools and materials climbed much further, his company might cancel some expansion plans. Another asked: "Why should we build new plants in a period of rising costs when we cannot keep our present facilities going?"

Machine tool makers in the Chicago area say that they have had no cancellations of importance in this region.

On the other hand, a survey by Chicago purchasing agents indicated that prices are already levelling off, that deliveries and inventories are improving, and that production is getting in line with demand. The big question, according to some manufacturers, is whether demand will not continue to decline after it gets down to parity with output.

The purchasing agents said that backlogs of orders are definitely on the down grade and that there has been a marked reduction in advance buying.

On the whole, a prominent manufacturer characterized the present period in Chicago metal working as one of "uneasiness" and "restrained pessimism."

Interim World Engineering Organization Formed in Paris

PARIS — An interim organization, the "World Engineering Conference" has been set up as a result of the unanimous decision of major delegates to the International Technical Congress, held here from Sept. 16-20 and attended by 1200 engineers from 30 countries, including the United States. It is hoped that the interim organization will eventually become a world federation of engineering groups.

The conference will be headed by a twelve-nation executive board and a president, Col. A. Antoine, Inspector General of Electricity of France. Nations elected to the executive board are Great Britain, the United States, France, Switzerland, Czechoslovakia, China, India, Egypt and Poland, with three places left open for inclusion of countries absent at the congress, such as Russia.

Nine temporary members on the executive board have been appointed, subject to approval by the engineering societies in each country, and the board is functioning. U. S. representative is Fentonn Turck, member of Joint Committee on International Relations for the Engineers' Joint Council of the U. S. The board will: (1) wind up the business of the 1946 congress; (2) pave the way for a future world engineering federation (probably of societies instead of individual engineers); (3) call other international technical congresses for eventually inaugurating the federation; (4) conduct other business, such as contacting and working with economic and social council of the United Nations.

Auto Industry Moves to Cut Costs, As Materials and Parts Deliveries Lag

DETROIT—Layoffs in the automobile industry were based upon these factors: (1) inability to get even limited supplies of materials, particularly steel, in quantities sufficient for any sort of efficiency in production; (2) an inability to further absorb losses by giving steady employment without thought to production costs thrown out of whack by uncertain work schedules, and (3) realization that labor, at present, does not intend to hold down costs, but instead favors absenteeism (now 10% or better) and aimlessly drifts from one job to another without provocation, causing an abnormal quit rate. These are accepted as aftermaths of the war. However, the idea of getting out cars regardless of cost or effort must now give way to sober realization of losses entailed.

Deliveries Uneven

Deliveries of steel, castings and other supplies are in lamentable state despite the best efforts and pressure of top ranking executives upon sources of supplies. It is suspected that production inefficiencies, losses under price control, absenteeism and a high quit rate are also present in the supplier's plants, with the result that materials arrive in dribs and drabs, or not at all, and the famed basis of mass production "materials and labor are brought together at the right point and time and in proper quantity" can not be realized. For example, steel for door panels arrives in quantity for a 3-hr. press run, no more will be available until the following week; bumper stock was used up this morning, the next delivery will be three weeks hence; strip for grille work must be cut from stock needed for a different product.

Costs Multiplied

Results: (1) men are shifted from job to job, no operation can achieve the smoothness of continuous operation; (2) steel stock unsuited to mass production modern tooling must be handled by more costly methods involving use of several times as much machinery and men; (3) production crews are unbalanced.

So the word has gone out in some plants to run the operations as efficiently as possible, considering material supplies, and to call in the men only for the days they are actually needed. In view of this decision, men will be asked if they wish to continue on payroll. Then, cutbacks in employment will be made on basis of seniority.

1947 May Be Better

By Spring, it is hoped that present demoralized conditions will take a turn for the better. This is only a hope. The conditions which may take 6 months to improve measurably, are considered to be an aftermath of the war. But it is realized that something must be done to combat absenteeism in any case. For workers can figure like anybody else, and evidently they believe that there is no point in earning more than at the rate of $2400 per annum, thus to avoid getting into the income tax bracket.

But faith in the future is not dead. The 1948 models, planned for production in late summer or early fall of 1947, will mark radical departures in styling. The largest die programs in years are planned. Engineering is late, but management has approved 1948 styling. Orders for dies will probably start coming through in late November and December.

Dies will cost a lot more. Time charges in the Detroit area are up approximately 50%. It will also take more time to build dies under present conditions.

Improvements Pushed

There will be refinements in engines and transmissions. Additional makes will have hydraulic transmissions or at least devices for easier or reduced shifting.

Management is now considering proposals for expenditures of millions for new equipment. And this despite knowledge that uncompleted expansion programs are costing twice the original estimates.

The fact is: auto managements anticipate that when they roll out the 1948 models, customers will be more choosey, efficiency must and will return. That's why the industry is ready to gamble on the future.

Machine Tool Orders Slump, Despite Buying by Farm Implement Makers

CLEVELAND — Farm implement manufacturers in the Chicago area have been placing heavy orders for machine tools, which is one of the few cheerful notes in the general outlook for machine tool builders. For the present, the automotive, steel and railroad industries are at a low ebb in ordering. However, some small buying is being done by the home appliance industry, and the bulk of present business is spotty.

Skilled Labor Short

Lack of skilled workers, particularly tool makers, die sinkers, and set up men, is tending to hold up full scale production in a number of Cleveland plants. Trying to line up skilled workers for second and third shifts is particularly difficult under such conditions.

With the end of the war, the company-maintained schools for training men in the skilled trades ended and there have been few men given this special training since that time. There are reports of the possible resumption of these schools, in view of the growing realization that the shortage of skilled labor will be a longer drawn out situation than the shortage of materials.

The pig iron and steel shortage in this area is aggravated by the scrap shortage. Several foundries and open-hearths are threatened with shutdowns unless the situation improves. Steel mills have been unable to stockpile scrap for this winter, and are in the worst position they have ever been on this score.

Scrap Supply Down

Scrap dealers say that very little scrap is coming from the railroads and from farms, which are normally good sources of the material. The accumulation of working inventories in fabricating plants is keeping the supply of industrial scrap going back to the mills at levels below earlier expectations.

Distributor's Line Completed

NEW YORK — Rudel-Carey, Inc., sales and engineering distributors of small tools and other industrial equipment and accessories, has completed its distribution agreements and is established in its new quarters at 435 Fourth Avenue, New York City. The firm offers an engineering and cost reducing approach to its customers' production problems with respect to the selection of high speed and carbide cutting tools, grinding wheels, machine tool attachments and accessories, light machine tools and materials handling equipment.

Detroit Letter

Production Outlook

Forward automobile output pattern looks something like this: October, modestly increasing, in line with previous modest week-to-week gains. November, a leveling off. December, a decline caused by the loss of working time during the holidays and by the beginnings of short inventory periods during which the modest changeovers preceding new model output will take place.

After the turn of the year volume should increase steadily for all makers, but there probably will be no notable jumps until spring. By then there should be an improved flow of lead, copper, steel, and other materials, which should reflect itself in larger volume. Production, therefore, may spiral upward during the second quarter, until the shutdowns for changeover to 1948 models take place.

Strike Limitations

These anticipations do not take into account the possibility of major strikes in the industry. Chrysler continues to be under labor's gun, the selected guinea pig for new wage demands from the C.I.O. United Auto Workers Union, over which negotiations will begin very shortly. If Chrysler is struck during the winter, the assembly total for the industry will quite obviously be affected, but other producers may be able to obtain supplies which otherwise would be consigned to Chrysler.

This latter anticipation bases on the growing supplier practice of diverting shipments from strike-bound plants to others in need. This has become so common-place that manufacturers with short-lived labor tieups on their hands prefer to keep as quiet as possible about them, in the hope that the shutdown period will enable them to bolster their banks of hard-to-get parts.

Light Car Halt

Announcement that the light car programs of Chevrolet and Ford have been stopped does not mean a cancellation of these programs. The stop orders appear more in the nature of a postponement.

At General Motors, the reported reason was the belief that materials would continue in short supply next year, and that any output of new types of Chevrolets would simply mean further spreading of available supplies between the divisions, with no net gain realized out of an expenditure of $50,000,000 or more. This is self-evident sound logic. In the meantime, Chevrolet's crew of development and experimental engineers is continuing at work on the Chevrolet Fifty, and probably will be able to use the time effectively to work out problems.

At Ford, the discontinuance of the light car division grew simply out of the fact that it became impossible to put a new car on the market within a year from now. An early prototype which looked good a few months ago turned out to have flaws serious enough to compel some redesign work of real consequence.

Ford Transmission Delay

Ford, meanwhile, has put a stopper on still another major program, for much the same reason. Originally it had intended to introduce an automatic transmission on 1948 model Mercury and Lincoln cars, made by the Detroit Gear Division of Borg-Warner Corp. The division had gone ahead with plans to build a new plant in the Detroit area, and had ordered considerable tooling for the project.

As testing progressed at the Rouge, however, the conclusion was reached that the transmission in its present form did not measure up to the requirements wanted. The result was a notification that changes would have to be made. Inasmuch as these could not be completed in the available time, and probably because major specifications had to be changed, machine tool orders covering the job were suspended.

Unionizing Foundries

The eyes of the auto union, always looking for uncultivated fields, have focused on the foundries. A national foundry conference of the U.A.W., scheduled for Dec. 7 and 8 at Milwaukee, will draft a program "to improve wages and working conditions."

R. J. Thomas, union vice-president in charge of the activity, promised a full power organizational campaign as well as a drive for industrywide equalization. At the same time, customary criticism was voiced, charging foundry operators with low wage scales, bad working conditions, etc.

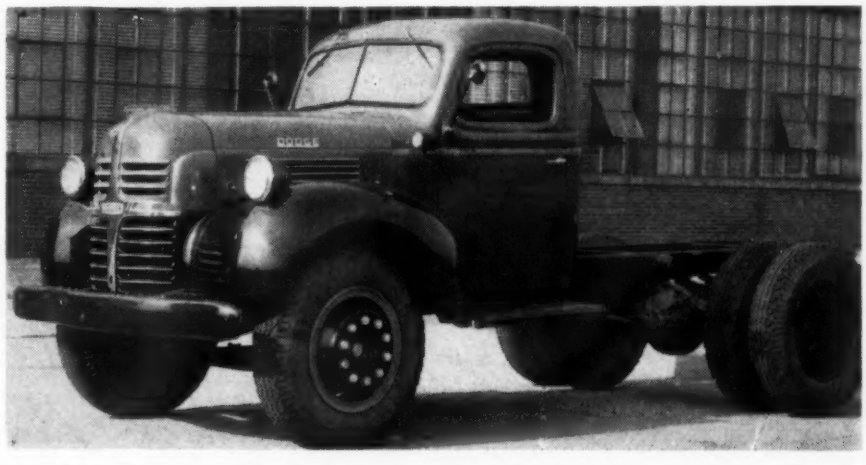
Jet Marine Engines

Jet propulsion has moved into a new field—marine engines. Considerable interest has been aroused in the boat-conscious Detroit area, as elsewhere, by the recent unveiling of a new type of powerplant for boats developed by Gray Marine Motor Co., division of Continental Motors.

While details remain undisclosed for the time being, the powerplant consists of an hydraulic unit, engine powered, which ejects a solid stream of water at high velocity through an underwater nozzle. Demonstrations showed that small boats, of a size often fitted with outboard engines, could be driven in a range between 10 and 25 m.p.h. These boats possessed most remarkable agility. Changing direction of the underwater nozzle produced sharp turns and reversed direction far beyond customary capabilities.

Inasmuch as the underwater jet functions best in shallow or marshy water, a hydropropelled boat can drive itself aground, and then, by reversing the nozzle, create enough draft under the hull to float the boat free.

The application of "hydropulsion," as Gray Marine calls it, is still a good distance away from would-be customers. At present it is in the experimental stage, but all signs point to its initial introduction.



Dodge 3-Tonner—Two 3-ton heavy duty trucks have been added to the Dodge job-rated truck line. The trucks have a gross vehicle weight rating of 20,000 lbs. or over, while both have a tractor-trailer rating of 37,000 lbs. The engine used has a 331.35 cu. in. piston displacement

AMTDA Denounces WAA's Handling of Surplus Equipment; Officers Elected

HOT SPRINGS, VA.—The American Machine Tool Distributors' Association at its annual convention here condemned "the inefficiency and laxity" permeating the administration of disposal of surplus machine tools. The condemnation represented the thorough disgust of dealers with the actions and policies of the War Assets Administration after many months of trying to cooperate with WAA officials, offering free advice, time and effort, and attempting to sell surplus machine tools despite the inefficiency and irregularities of WAA district office staffs.

Dealers present were wrought up also over indications that WAA was going to ignore the advice of dealers and builders by changing the advisory committee on surplus machine tools to a dealership unit only, and by pending plans to change surplus tool pricing without discussing the matter with the advisory committee.

Other Demands on WAA

The AMTDA also resolved: (a) It demands that WAA aid the War and Navy Departments in setting up, out of surplus, reserves of machine tools for future defense; (b) It objects to the failure to consult on matters of policy with the machine tool industry, and demands that a real advisory committee be reconstructed and utilized for its advice on all policy matters; (c) It warns of the serious danger to the industry and to the disposal program existing in panicky, unsound and unworkable plans now contemplated (by WAA); (d) It urges that WAA officials "abstain from practices that may be mortally injurious to the machine tool industry and, therefore, to the future of the United States."

This resolution followed a thorough discussion of the surplus machine tool situation, after the report of Robert L. Giebel, chairman, Committee on Surplus Property. Mr. Giebel's report (American Machinist, Sept. 26, '46, p. 154) indicated that most dealers were dissatisfied with WAA's conduct of surplus sales, according to a survey of AMTDA members.

Einig, Berna Speak

Mr. A. B. Einig, president, Motch & Merryweather Machinery Co., Cleveland, discussed general conditions in various countries based on his observations while abroad with the Pauley Mission on reparations. He said that the entire German war machine was centered upon its machine tool industry. He also mentioned his visit to Japan (American Machinist, Sept. 12, '46, p. 156).

Tell Berna, General Manager, National Machine Tool Builders' Assn., pointed out the decline in monthly new orders from $27,000,000 to about $20,000,000. He attributed this decline to material shortages, labor difficulties, and other factors discouraging equipment purchasers. He said that the potential market for new machinery was good, but that the uncertain business situation had to be cleared up first.

Plastics Machinery

M. L. Macht, Plastics Department, E. I. duPont deNemours & Co., gave an illustrated talk on plastics machinery. Film slides aided this explanation of the workings of injection molding machines, and special plastics equipment to buff, saw, mill, and turning this material.

Scrolls of appreciation for their efforts on behalf of dealers were presented to A. B. Einig and A.G.Bryant, Bryant Machinery & Engineering Co. The two dealers also received gold watches.

New A.M.T.D.A. Secretary-Treasurer

C. C. Brogan

Habicht President

Newly elected officers of the Association include: As president, George Habicht, Jr., Marshall & Huschart Machinery Co., Chicago; as vice-president, D. N. Macconel, Machinery Sales Co., Los Angeles; second vice-president, R. L. Giebel, Giebel, Inc., New York, N. Y.; secretary-treasurer, C. C. Brogan, W. E. Shipley Machinery Co., Philadelphia, Pa. Members of the Executive Committee until 1949 include: H. A. Perry, Perry Machinery Co., Dallas, Texas; George E. Young, C. H. Gosiger Machinery Co., Dayton, O.; George M. Harrower, Brown & Zortman Machinery Co., Pittsburgh, Pa.

Lodge & Shipley's Air-vent

CINCINNATI—Lodge & Shipley Machine Tool Co.'s Special Products Division reports rapid growth in distribution of its Risselt automatic air eliminator valves, said to assure 100% uniform heat for steam and vacuum systems. The company has an exclusive license to make and sell the air-vents, and has established distributors throughout the U. S.

New Officers of A.M.T.D.A.

President

George Habicht, Jr.

Vice President

D. N. Macconel

Second Vice President

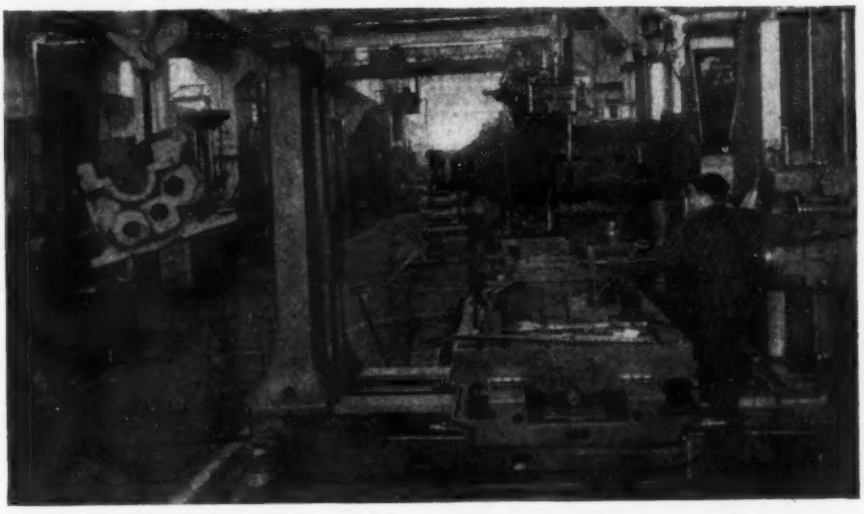
Robert L. Giebel

WARNER & SWASEY ADDS EARTH-MOVING UNIT

CLEVELAND—Adding to the diversification of Warner & Swasey Co.'s production is the Gradall, an earth-moving piece of equipment for use in construction and road-building. The Gradall is mounted on a truck chassis and has an extendable 24-foot boom which can be raised, lowered, tilted or swung 360 degrees. It will work efficiently under low - hanging wires or close to other obstructions, and has been used for snow removal, grading, excavating, trenching and pavement removal. Regularly established contractor's supply companies are now being appointed as distributors of the equipment.

Russian Machine Tool Plant to Boost Lathe Output 50%

In its current Five Year Plan, Russia hopes to increase its machine tool output to 74,000 units annually. By 1950, the Krasny Proletary Machine Works, Moscow, is expected to be producing 50% more standard lathes and ten times as many special lathes. Under the plan, wages of women factory workers, who make up a sizable portion of the industrial labor force, are to be boosted by 55%.



These scenes of the Krasny works, one of Russia's largest machine tool plants, indicate the relative progress of this key Soviet industry. The two photos at the right indicate the large scale building of machine tools achieved during the war. The machine in the top photo is a Giddings & Lewis horizontal boring mill, a key unit in the second machine shop of the works. The middle photo of the first assembly shop shows the painting of finished tools.

A young boy can be seen in the middle of the top photo, and women at work may be seen in the middle and bottom photos. The two girl mechanics shown below are said "to regularly turn out twice their daily quota."

At the lower right, the director of the tool works is shown in his office at his daily conference with plant executives. At the top of the pile of magazines on his desk may be seen a copy of American Machinist.

—World News Service

Unions Will Push New Wage Demands After Elections; Higher Prices Likely

NEW YORK—Management men who deal with the United Electrical, Radio & Machine Workers (C.I.O.) found nothing encouraging in the fact that U.E., while it mentioned a need for what it described as interim pay boosts, was silent about what it will seek in labor's second full-scale bid for higher wages.

The same silence about general policy — leaving other branches of management just as uneasy—was observed at conventions of C.I.O.'s rubber workers; gas, coke and chemical workers; mine, mill and smelter workers; shipbuilding workers, and other industrial unions.

It was not merely coincidence. The word had gone out from C.I.O. President Philip Murray and other top union strategists to limit wage action at conventions to generalities now, leave until later concrete demands against management.

Unions Play for Time

Hence, while settlement of recent maritime strikes was widely interpreted as opening the way to a flood of other union wage demands which would exceed the present stabilization policy, few such demands actually are to be forthcoming. It will not be because union policy-makers agree with Reconversion Director John R. Steelman that the maritime situation was unusual, and that the nation's wage program has not been in any way weakened. It will be only because most labor leaders are convinced this is not yet the time for a new wage test.

C.I.O., however, is quietly laying the groundwork now for its second postwar appearance at bargaining tables. Economists and research experts from its top unions have been busy for a month in Washington working out with C.I.O. staff members a new wage policy program to be submitted to government and management on behalf of all C.I.O.

Chrysler Contract Up

C.I.O. hopes to present its program this month, before the November elections. Plans are to offer it with a direct appeal for government and public support. But little pressure is expected to be applied behind it at that time, because C.I.O. has no intention of raising a barrier of belligerence and strikes which might handicap its Political Action Committee.

Typical will be the case of the Chrysler Motor Co., whose contract with the United Auto Workers will come up for renegotiation about Oct. 20. At that time U.A.W. ordinarily would be expected to talk tough, but probably will not for at least one month.

A safe guess is that the uneasy wage truce might be prolonged even more; that a form of cost-of-living bonus plan might be advanced—and possibly accepted by a large part of industry—to stave off major demands until after the start of 1947. Reasoning is that this year Murray's United Steelworkers of America (with contracts expiring Feb. 1, 1947), and U.E. and U.A.W. (with contract expirations and wage reopening clauses similarly timed) will attempt joint wage action. That was the plan before, and union leaders are firmly convinced that premature U.A.W. action in 1945 cost auto, steel and electrical unionists heavily in lost wages.

U. S. Wage Policy Weak

Meanwhile, government officials busily explained off the maritime settlement—which at the very least demonstrated clearly that the government wage policy can be broken whenever labor wishes to force a challenge—and reaffirmed confidence in President Truman's Feb. 14, 1946, wage yardstick and the National Wage Stabilization Board which has the hopeless job of trying to make it work. The fact that a subcommittee of the Office of War Mobilization and Reconversion, including C.I.O.'s Murray, was named to make a study of the wage stabilization program meant little. President Truman indicated as much when he announced that he does not plan to ask for new laws to combat union wage pressure.

Prices Or Productivity

Employers consequently have felt at a loss in policy planning.

Higher wages, they feel, can come only from higher prices—which no one actually wants—or from increased sales income from greater productivity. In this they have the partial support of A.F.L., which recently has talked in management-like words in urging that workers "must begin at once to increase productivity so that the next wage increases can be paid without raising living costs."

Constructively, management is being urged by top employer associations, the American Management Assn. and the National Assn. of Manufacturers, to consider for bargaining purposes stabilized employment guarantees (not annual wages regardless of time worked, but a stipulated schedule of work yearly) to workers. Thought is that with steady work and steady pay assured, the problems of productivity, higher pay, and other issues might be compromised to mutual advantage.

AFL Men Cross CIO Picket Line—With the CIO National Maritime Union striking the same day that the AFL Longshoremen called off their strike, the latter had few compunctions in crossing the CIO picket line to get back to work

Washington Bulletin

Surplus Furore

War Assets Administration officials state, in reply to several inquiries, that so far as they know surplus machine tools will continue to be sold at Clayton Formula prices indefinitely into next year. The inquiry was prompted by persistent reports that prices would be reduced on slow-moving items, and on items in poor shape due to intensive use or mishandling. Senator O'Mahoney's Military Affairs Subcommittee on Surpluses has recommended in a report that price of such equipment be reduced to take its condition into account.

The O'Mahoney committee charges that cutting tool manufacturers, acting as agents for the sale of surplus, in each case of their own manufacture only, and at market prices, have sold only about 2% of goods declared surplus. Committee, pointing out that a WAA site sale at Memphis recently disposed of 38% of inventory in three weeks, implies that manufacturer - agents ought to sell more, but it makes no specific recommendations on cutting tools. It does, however, recommend that agency agreements program be extended to cover a broader field of surplus. Agencies now handle electronics, airplane parts, cutting tools and machine tools.

"Regularized Employment"

OWMR's Latimer Committee on Anunal Wage Plans, now called "Regularized Employment" is due to report about now to OWMR's advisory board. The report will analyze available information on existing and past annual wage plans voluntarily adopted by various companies. Such plans have been, and will be, set up on various patterns. In general, companies will guarantee so much time per year, say six, nine months, on basis minimum work forces in the past, certainly not on maximum forces, or anywhere near it. Guarantees will be awarded on the basis of seniority, which will be an incentive for workers to stay on. Many employers have been regularizing employment for years, without calling it that, or even knowing it as the subject is now understood. The administration welcomes support of National Association of Manufacturers.

Higher Freight Rates

Railroads plea before Interstate Commerce Commission for a 25% rate increase may bring a compromise award, but the question is: When? Commissioners cannot ignore rail statement that they remain an outstanding exception to the otherwise inflated economy. Even more impressive is the unfavorable position of Pennsylvania Railroad, with its long record of dividend payments. Pennsy, New York Central, and Southern Pacific-Texas New Orleans estimated their 1947 net, without carryback credits, would show large deficits. Actually, Association of American Railroads claims, the 25% is a maximum, and the average would be about 20%. But ICC is susceptible to administration pressure, and may have to stall, because a freight increase right now would have strong inflationary effect, right across the board.

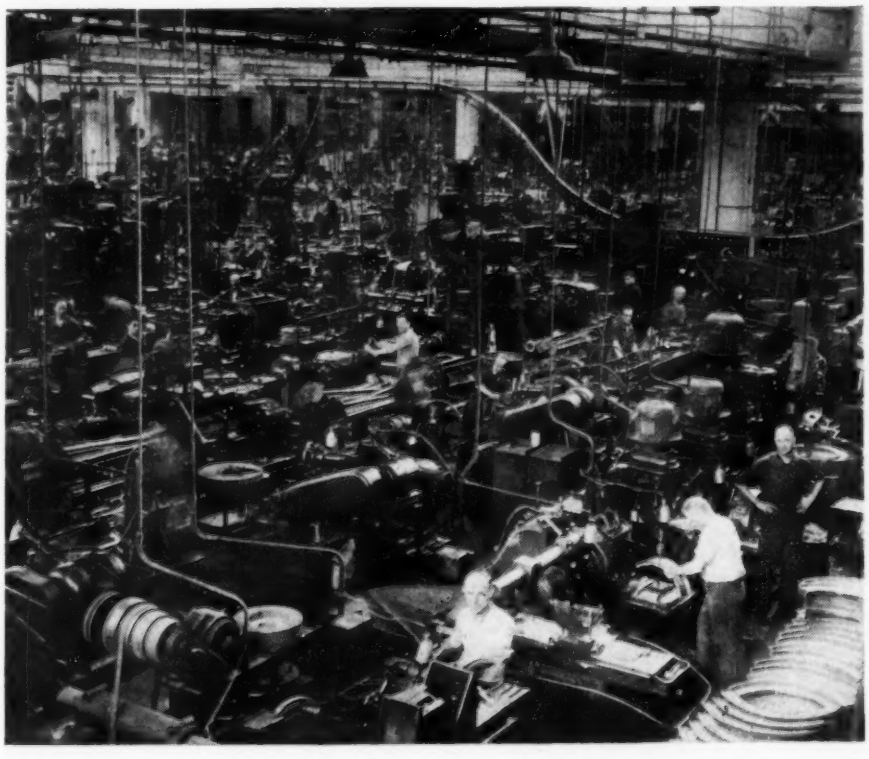
Foreign Trade Controls

Unofficially, State Department people are talking up legislation to give the administration authority over commercial export-import business as a lever in international relations. Pressure could be brought on another government by refusing it American skill, materials, equipment, patents. The idea will be opposed as interference with free enterprise, interference with free trade, as repudiation of "most-favored nation" policy. But most other governments do use trade as a political weapon.

However, this device would offset disadvantages of U. S. exporters dealing with foreign governments.

TRUTH ABOUT THE $40,000 CUTTING TOOL STORY

WASHINGTON—The charges of the Senate Military Affairs subcommittee on surplus that one manufacturer sold $431 worth of surplus cutting tools at an expense of $40,000 were ridiculed by people knowing the inside story. Fact is the manufacturer in question is taking care of $3,000,000 worth of surplus cutting tools for the government, and the expenses are against that total. He had to store them separately under government regulations, equip an old building with steel bins, degreasing vats, pay for the job of unpacking assorted tools, degreasing them, sorting them and removing special markings from them. This job had to be done before sales could start. But the sale of $431 worth does not end the transaction, as subcommittee publicity implied.



Italian Sub-Assembly Lines—Parts and components collected in this section on the Fiat Mirafiori plant in Turin, Italy, will ultimately be used in the main truck assembly line of the plant

Some Steel Cancellations Develop; Priorities Complicate Distribution

PITTSBURGH—Inability of a few customers to take their full quotas of steel has resulted in a few cancellations. However, this is the exception, rather than the rule, since the clamor for shipments continues. In any event, some fabricators have apparently gotten ahead of their customers' ability to consume certain parts, especially with the consuming plants unable to secure deliveries of other parts from other sources to maintain sustained operations. This condition has resulted in some fabricators being asked by their customers to curtail shipments, and inability of the former to inventory too much steel or fabricated parts has caused steel cancellations.

Steel Deliveries May Ease

While the development is only scattered, it may point to an extension of this practice as the ramifications of cut-backs in the auto industry are felt. This points to continued easing in pressure for steel deliveries over the next several months, although demand will sustain 90% operations for many months to come. Steel officials think it will take a year before the industry can catch up with demand, with the greatest time required in balancing demand and supply in light flat-rolled steel products.

Due to its favorable location, this area is not expected to have a scrap crisis which would affect production until cold weather sets in. But the industry's scrap difficulties in other areas have only intensified the pig iron bottleneck, in which the major sufferers are merchant pig iron users.

Effects of Federal Action

Government premiums on merchant pig iron production will slowly aid the situation. Pig iron allocations for housing, farm equipment and brake shoes have prevented some foundries from serving their regular customers who cannot qualify for such ratings. These customers are being compelled to shut down for short periods due to lack of pig iron.

The rating situation in steel reached the point where the CPA decided to do something about it. Rated orders are concentrated largely in sheets, and while they bulk large in relation to sheets, they are merely 5% or so of total production. But mills were getting rated customers they had never sold before; non-rated customers were having their quotas reduced to the point where they could not operate economically; non-rated customers for galvanized sheets were virtually frozen out for the fourth quarter; and mills had begun to charge discrimination in the amount of rated business they were forced to take in contrast with that of other mills.

With several hundred thousand tons of rating applications for the fourth quarter yet to be processed, CPA undertook a survey of the mills' situation, indicating it would cut down on further ratings and equalize the mills' obligation to fill rated orders.

NEW CONSTRUCTION AND EXPANSION

General Electric Co. has recently purchased two plants from the government which it operated during the war. The plants are the Fitchburg, Mass. turbine plant, where the company will spend $500,000 for the expansion of research and production facilities, and the Ft. Wayne, Ind. fractional-hp. motor plant.

B. F. Goodrich Co., Akron, Ohio, is leasing a government building adjoining **Waco Aircraft Co.,** Troy, Ohio, to house the company's aircraft brake and wheel manufacturing division.

Monsanto Chemical Co. has purchased for $9,550,000 from WAA the Texas City, Texas, styrene plant which Monsanto built and operated during the war as part of the government's synthetic rubber program. The plant will be a part of the company's expanded polystyrene plastic production.

United States Rubber Co. is planning to triple its production of high-speed grinding wheels. Increased production facilities will be established in a new plant in Ft. Wayne, Ind., recently acquired from the government.

The Buffalo Machinery Co., Buffalo, N. Y., is planning a broad expansion program which will triple present facilities and output. On property they expect to purchase, the firm will erect buildings for the production of reversible steam turbines, air motors, rectifiers and other equipment.

American Brake Shoe Co. has started construction of a 35,000 sq. ft. plant in Niles, Ohio for the manufacture of railroad journal bearings, to be operated by the **National Bearing Div.**

Fairfield Sheet Mill of Tennessee Coal, Iron and Railroad Co., Birmingham, Ala., has undertaken an extensive construction program to modernize and improve the facilities for the production of sheet.

International Engine Rebuild Corp., Dallas, Texas, is constructing a $250,000 plant in Garland, Texas. The plant will be equipped with $250,000 worth of machinery.

Cragin Manufacturers, 4615 Alger St., Los Angeles, is building a 35,000 sq. ft. addition to its plant for the manufacture of dies, tools, jigs, fixtures and special machines.

Pacific Airmotive Corp. will consolidate its manufacturing, warehouse and service facilities at 2940 No. Hollywood Way, Burbank, Calif., in a $750,000 expansion.

American Radiator & Standard Sanitary Corp., Pittsburgh, is planning a $3,500,000 factory in Richmond, Calif., for the manufacture of brass plumbing fixtures.

Sterling Electric Motors, Inc., Los Angeles, is spending $600,000 to modernize equipment and erect new buildings.

F. A. Smith Co., Rochester, N. Y., is constructing a 40,000 sq. ft. plant at Hornell, N. Y., for the manufacture of electric fans, ventilating equipment and automobile accessories. Production is scheduled to begin in January.

The Bassick Co., Div. Stewart-Warner Corp., Chicago, has acquired from the government the former plant of the **Vought-Sikorsky Div., United Aircraft Corp.,** Bridgeport, Conn. A capital investment of some $2,500,000 includes the purchase price, necessary renovations, machinery installation and new construction.

Century Foundry, St. Louis, Mo., has started construction of a 100,000 sq. ft. factory addition to its present plant with an estimated expenditure of $750,000, including machinery. The addition is expected to be completed by December.

Sheffield Steel Corp., Houston, Texas, has projected an expansion program to nearly double the size of its plant at a $2,400,000 cost.

Names in the News

A. W. Lovell

Henry Hillerman

Allen W. Lovell, former sales manager, has been appointed general manager of Modern Collet and Machine Co., Ecorse, Mich. He has been succeeded as sales manager by **Henry Hillerman.** Before joining the company in 1944, Mr. Lovell had been associated with SKF Industries, Jack & Heintz and Sperry Gyroscope Co. For more than a year he has been in charge of production and development work. Mr. Hillerman joined Modern Collet in 1943 and was previously associated with various screw machine product companies in the Detroit area.

Robert Potter, formerly chief engineer of the Rolling Mill Div., E. W. Bliss Co., Salem, Ohio, has been appointed manager. Prior to joining Bliss last January, Mr. Potter was chief engineer of Superior Steel Co.

Frank A. Maley, formerly with Curtiss-Wright Corp., has been appointed purchasing agent of Bell Aircraft Corp., Buffalo, N. Y., succeding **Hugh A. Holmberg,** resigned.

J. E. Fifield, formerly with the U. S. Naval Research Laboratory and the American Brake Shoe Co., has joined the development and research division of The International Nickel Co., Inc. Also, **E. A. Tice** has joined the corrosion engineering section of the division as corrosion engineer.

John L. Newell has joined the C. M. Smillie Co., Detroit, as eastern sales representative with headquarters at 2 Salem Pl., Livingston, N. J.

James R. Reed has been named manager of the commercial research department of Allis-Chalmers Mfg. Co., Milwaukee, Wis.

John W. Mighton has joined the magnesium sales staff of The Dow Chemical Co., Midland, Mich.

Earnest V. Haines has been named to head the newly-created patent department of International Minerals & Chemical Corp., Chicago.

T. L. Kishbaugh has become associated with the new Los Angeles plant of Joseph T. Ryerson & Son, Inc.

J. P. Martel has been appointed manager of the design division of the engineering department of E. I. duPont deNemours & Co., to succeed **Melvin F. Wood,** who was recently appointed assistant chief engineer of the company.

Norman R. Stiles has been elected president and treasurer of the Chisholm-Ryder Co., Inc., succeeding the late **Stephen M. Ryder.** Mr. Stiles was formerly assistant to the president.

J. Raymond Dailey has been named superintendent of J. L. Lucas & Son, Inc., machinery rebuilders and dealers of Fairfield, Conn.

P. L. Coddington has been appointed manager of sales for the Welded Alloy Tube Div., The Carpenter Steel Co., Kenilworth, N. J.

Edward C. Logelin, Jr. has been appointed director of public relations for United States Steel Corp. subsidiaries in the Chicago district.

Edward A. Ossmann is now a factory representative for Allen B. DuMont Laboratories, Inc. in New York State, excluding metropolitan New York and Long Island. His office is in Rochester.

Frank Brunner, formerly assistant superintendent of the Stearns Magnetic Mfg. Co., Milwaukee, Wis. main plant, has been advanced to superintendent of the firm's brake factory.

Carl G. Rising, for 18 years superintendent of the metals division of National Blank Book Co., Holyoke, Mass., has been promoted to chief engineer of the company's operations.

H. R. McLaren has been named assistant general superintendent of The Timken Roller Bearing Co., Steel & Tube Div., Canton, Ohio, while **J. P. Wargo** has become superintendent of tube mills and **R. R. Elsasser** is the latter's assistant.

Fayette Leister has been elected vice president in charge of engineering of The Fafnir Bearing Co., New Britain, Conn.

Herbert C. Graves, Jr., has been named chief engineer for Gibson Electric Co., Pittsburgh.

R. J. Leckrone has been appointed chief engineer in charge of engineering and machinery sales for the Pittsburgh Steel Foundry Corp., Glassport, Pa.

Joseph M. Shinn has retired as production manager of the Buffalo Tube Works of General Electric Co. He has been with the company more than 38 years.

William J. Kerr has been appointed vice president in charge of production of The Yoder Co., Cleveland. He has been factory manager of the company for the past five years. At the same time, **Norbert C. Rubin** was named vice president in charge of sales.

Cleve H. Pomeroy

Arthur Zimmerman

Cleve H. Pomeroy, vice president and secretary-treasurer of National Malleable & Steel Castings Co., Cleveland, was recently elected president of the firm, succeeding the late **Charles H. McCrea.** Mr. Pomeroy has been with National Malleable since 1920 where he has served in various financial posts until he was elected vice president in charge of finances and accounting in 1944.

Arthur Zimmerman has been appointed sales manager of The Steel Improvement & Forge Co., Cleveland. He was formerly assistant chief engineer of Weatherhead Co., Cleveland.

Dr. C. K. Bump and **H. W. Mohrman** have been appointed assistant directors of research of the Plastics Div., Monsanto Chemcial Co.

Louis R. Popp, former vice president, has been elected president and general manager of Pierce Renewable Fuses, Inc., Buffalo, N. Y. to succeed **William Brennan, Jr.,** who has been named chairman of the board. At the same time, **Arthur M. Popp,** formerly factory manager, became vice president and general works manager while **D. O. Granger** is general sales manager.

BUSINESS ITEMS

Martin T. Bennett, consulting engineer, has opened an office at 917 Fifteenth St., N. W., Washington, D. C. for the practice of general industrial engineering with special facilities for foreign developments.

Industrial Oven Engineering Co., Cleveland, has changed its name to **Industrial Ovens, Inc.** and moved to its new plant and offices at 13825 Triskett Rd.

Crescent Corp., Fall River Mass., has acquired the **Potter and Johnston Machine Co.,** Pawtucket, R. I. **Jacob Ziskind,** president of Crescent, will also serve as president of Potter and Johnston. Other new officers include: **J. Earle Makant,** vice president in charge of plant operations; **J. Potter Cunningham,** vice president in charge of sales; and **Norman R. Earle,** vice president.

Steel Improvement & Forge Co., Cleveland has inaugurated a turbine forgings division to specialize in parts of high temperature alloys required for gas turbines and turbosuperchargers. **Carl I. Schweizer,** chief metallurgist, will head the division.

Voss Machinery Co., 2882 West Liberty Ave., Pittsburgh, has been named exclusive representative for **Thriftmaster Products Div., Thomson Industries, Inc.,** New York City and will engineer and service Thriftmaster multiple spindle drillheads in western Pa., W. Va., eastern Ohio and western Md.

Taco West Corp., 2620 So. Park Ave., Chicago has been formed to manufacture and market automatic electronic control devices. Officers of the corporation include: **Theodore A. Cohen,** founder and former vice president of Wheelco Instruments Co., as president, while **Richard K. West,** who was formerly associated with Bakelite Corp. and Bell Aircraft, will serve as secretary-treasurer.

Federal Electric Products Co., Newark, N. J. has purchased the **Wurdack Co.,** St. Louis, Mo., manufacturer of electrical panel boards and switchboards. At the same time, **Cole Products Co.,** Long Island City, N. Y., long affiliated with Federal, will be merged into Federal Electric.

Denison Engineering Co., Columbus, Ohio, has appointed **John C. Eide Co.,** 200 Washintgon Ave. No., Minneapolis, Minn., as its dealer for the Denison Multipress in Minn. and western Wis.

The Landis Tool Co., Waynesboro, Pa. has opened a new office at 3091 Mayfield Rd., Cleveland, of which **P. E. Beaver** will be manager.

Pennsylvania Flexible Metallic Tubing Co., Philadelphia, has instituted a piping layout design service as part of the function of its engineering department.

Barium Steel Corp. has acquired the **Wiley Equipment Co.,** Port Deposit, Md. and **Wiley Mfg. Co.,** Mountville, Pa., manufacturers and fabricators of cranes, barges, hoisting and loading equipment.

General Electric Co. Electric Welding Div. has opened a new branch in Houston, Texas, with **F. C. Neal, Jr.,** as manager.

P. F. Bronckhurst has opened a western agency for **Hydropress, Inc.,** New York City, at 1065 Gas & Electric Building., Denver, Colo. Mr. Bronckhurst was formerly associated with various machine tool firms.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel, Chicago, Ill. Oct. 28-30. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Management Association. Production meeting. Palmer House. Chicago, Ill. Nov. 14-15. American Management Association, 330 W. 42 St., New York 18, N. Y.

American Society for Metals. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. Graves Taylor, 7301 Euclid Ave., Cleveland 3, Ohio.

American Society of Body Engineers. Technical Convention. Rackham Memorial Bldg., Detroit, Mich. Oct. 23-25. Carl W. Cenzer, chairman, 100 Farnsworth Ave., Detroit, Mich.

American Society of Tool Engineers. Semi-annual meeting. Hotel William Penn, Pittsburgh, Pa. Oct. 10-12. J. M. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit, Mich.

American Welding Society. Annual meeting. Atlantic City, N. J. Nov. 17-22. American Welding Society, 33 W. 39th St., New York 18, N. Y.

Industrial Management Society. Tenth Annual National Time and Motion Study Clinic. Hotel Continental, Chicago, Ill. Nov. 6-8. R. R. Landes, general chairman, 176 W. Adams St., Chicago 3, Ill.

National Conference of Hydraulic Machinery. Second annual meeting. Hotel Continental, Chicago, Ill. Oct. 22-23. Frank E. Wheeler, Illinois Institute of Technology News Bureau, 41-43 W. 33 St., Chicago, Ill.

National Metal Congress and Exposition. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

National Tool & Die Manufacturers Association. Annual meeting. Congress Hotel, Chicago, Ill. Oct. 23-26. George S. Eaton, executive secretary, 1412 Union Commerce Bldg., Cleveland 14, Ohio.

Society of Automotive Engineers. National Transportation & Maintenance meeting. Hotel Knickerbocker, Chicago, Ill., Oct. 16-17. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

OBITUARIES

Laurence S. Andrich

Laurence S. Andrich, vice president and general manager of Snyder Tool & Engineering Co., Detroit, passed away Sept. 10 after a long illness. Prior to joining Snyder in 1928 he served as a tool engineer for Oakland and Dodge. For a number of years he was vice president in charge of sales and engineering for Snyder and for the past year he has been vice president and general manager.

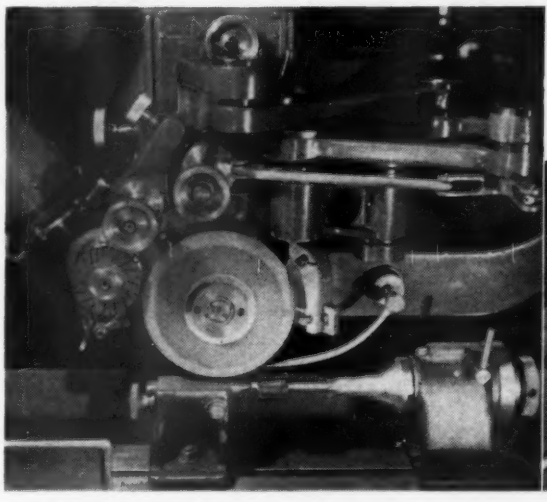
LeRoy Gould, 73, retired executive of National Malleable & Steel Castings Co., Cleveland, died Sept. 18. Mr. Gould joined Cleveland Malleable Iron Co., predecessor of the present concern, in 1890. From 1929 until his retirement last January, Mr. Gould served as assistant comptroller of the company.

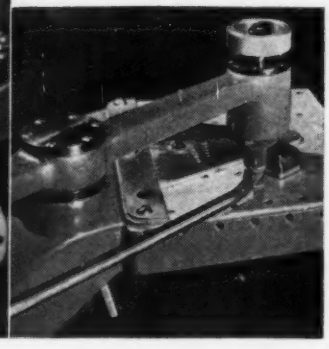
Charles H. Schueddig, 82, president of the Charles Schueddig Tool Works, St. Louis, Mo., for the past 50 years, died August 30.

Charles C. Meldrum, 64, maintenance supervisor of Brown-Lipe-Chapin Div., General Motors Corp., passed away Sept. 7 at his home in Syracuse, N. Y.

Shop Equipment News

Moore Panto-Crush Wheel Dresser Combines Crush, Diamond Dressing





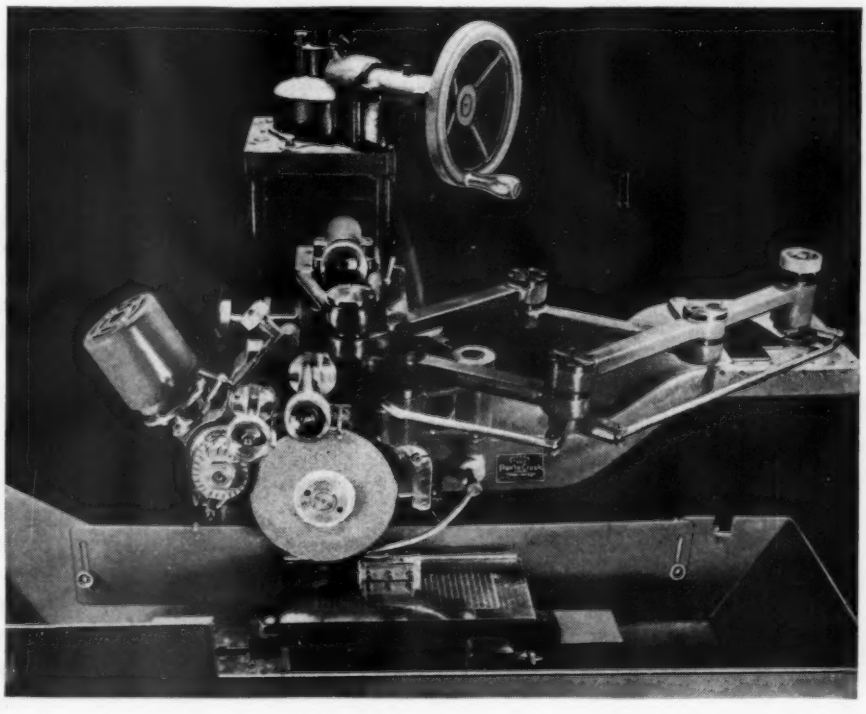
The stylus and diamond tool are capable of coordinated angular rotation to permit changing angle of approach of the diamond to the wheel. One angular position is shown above, another in the general view below. This permits approaches otherwise inaccessible, promotes uniform wear of the diamond, permits grinding larger or smaller forms with the same templet

PANTOGRAPHIC diamond form wheel dressing is combined with roll crushing in a special unit, the Panto-Crush Wheel Dresser, made by the Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn. The pantograph has a 10 to 1 ratio between follower and diamond tool. Irregular forms can be dressed repeatedly once the templet is installed. The only skill needed is in the preparation of the templet.

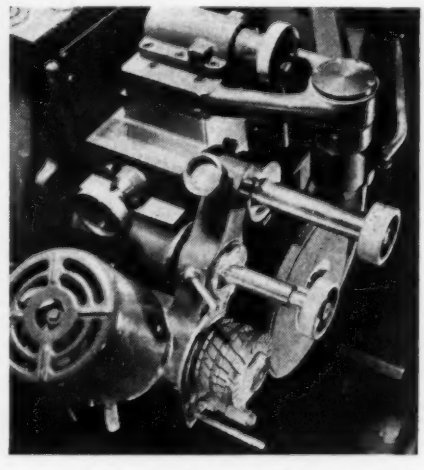
The power-driven roll crusher is ground in place by the diamond-dressed wheel from the original templet. It is used in the same spindle. The operator may use either method of dressing without disturbing the workpiece. It is not necessary to raise or lower the wheel spindle to dress the wheel, but it can be done without losing the relation of wheel to dressing device.

The combination is said to reduce diamond wear since crush dressing is used for the major part of the grinding with the diamond used only to dress the wheel for grinding the crusher roll and for finish grinding.

The crusher roll drives the wheel spindle by friction. This action produces true rolling without requiring an auxiliary slow-speed drive for the grinding spindle.

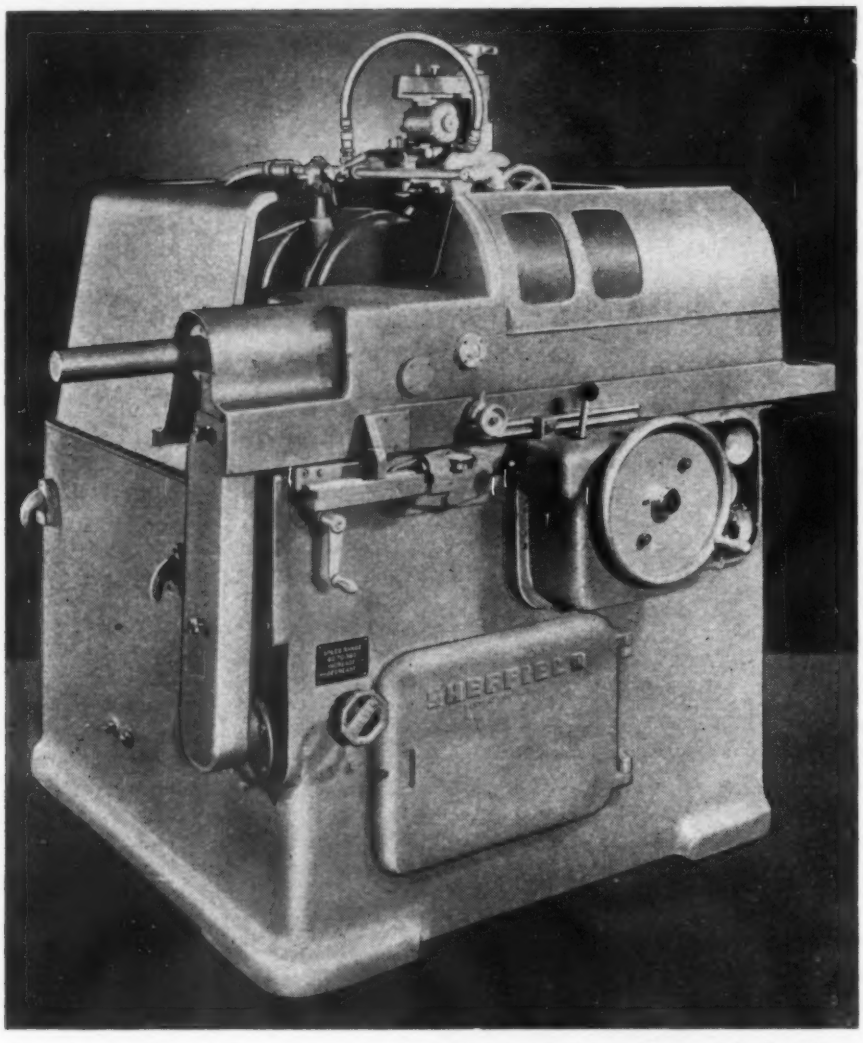


Roll crushing and diamond dressing are combined in this wheel-dressing unit which uses a pantograph. Maximum width or depth of contour capacity is determined by practical grinding limits rather than by the size of the device



One position of the slide bar with crusher roll related to formed wheel. The slide bar is moved to the next position for the next section of the roll

Sheffield Annular Form Grinder Uses Crush-dressing Principle



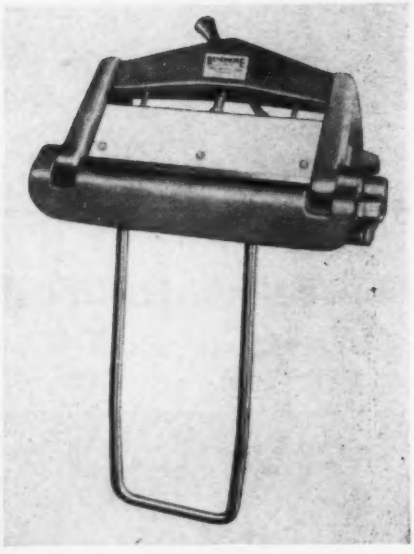
A surface finish of 10 to 15 microinches RMS is possible, using crush dressing, with this annular form grinder. Micrometer control of table position is provided, as a table lock to prevent work shifting with respect to the wheel during the cycle

A precision annular form grinder which utilizes the "Crushtrue" principle of wheel dressing is announced by Sheffield Corp., Dayton, Ohio. It is used for the production of annular and cylindrical forms such as circular form tools, crusher rolls, ball-bearing seals, seaming rolls, shift grooves in transmission gears, and other profiles. It is said to be the first machine of this special type made available to American industry.

The base, work table, wheelhead, wheel-feeding mechanism, and semi-automatic "crushtruing" device are similar to the Thread and Form Grinder, Model 101. The workhead and workhead drives are new.

A variable speed geared-head motor drives the workhead spindle in either direction. Standard work speed range is 60 to 360 rpm. A handcrank engages with the lead screw and is used for table positioning. Micrometer control of the table position is provided by a fine adjustment knob and a table lock preyents shifting of work with respect to the wheel during the cycle. A precision spacing attachment is available.

After the work is loaded, the operator lifts the throw-out lever which brings the wheelhead toward the work 0.111 in. The handwheel, graduated in 0.0005-in. increments, is used to feed the wheel to the proper depth. Automatic infeed cycle is available as optional equipment.



HAND BRAKE—The "Bendmore" handles material up to 3/32-in. thick, and 12-in. wide with bends possible to 135°. Made by Carl Wirth & Son, 1625 Clinton Ave. No., Rochester 5, N. Y., the machine has a stop adjustable for the full range

Holden H. T. Conveyor System Uses Separate Standard Units

A simplified system of automatic conveyors for production heat-treatment has been developed by the A. F. Holden Co., New Haven, Conn. The equipment can be used for conventional heat-treating, austempering, martempering, flow heat-treatment, liquid carburizing, and cycle-annealing.

Transfer units are structurally separate and independent from the horizontal transport conveyor, and can be installed at any point. The horizontal conveyor can be made in separate sections to fit each step in the process, with the section driven by connecting chains and sprocket transmission.

Cycle and transfer timing can be adjusted for each step of the process independently. No permanent, overall structure is required, and the conveyor is shipped in prefabricated units.

The basic units are the main drive, loading transfer, variable-speed transfer, constant-speed transfer, air-cooling transfer, oil dipping and unloading unit, and horizontal conveyor. The main drive drives the horizontal conveyors and the loading transfer unit. Each of the other transfer units is individually driven by an electric motor. Safety devices are provided at each transfer unit to stop operation in case a transfer unit fails to pick up the work.

"SATISFACTORY . . . for the fussiest of work"

. . . says INDIANA GEAR WORKS INDIANAPOLIS, INDIANA

For complete details on Lodge & Shipley 12, 14 and 16" Lathes, write for Bulletins Nos. 500 and 508.

● They may be prejudiced at Indiana Gear Works, manufacturers of gears, cams and other precision machine parts—but we like it! This noted firm says: "We like our Lodge & Shipley lathes so well that when they are tired, we replace them with Lodge & Shipley Lathes." This well expresses the universal satisfaction customers feel for these fine lathes.

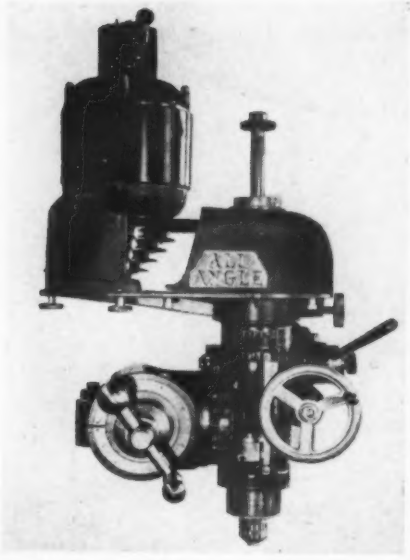
At Indiana Gear Works, difficult jobs are commonplace, yet—"The production afforded by the Lodge & Shipley lathes is as high as the complexity of the work will permit." A battery of L & S 14" lathes (left) finish turn experimental and production parts of ". . . the toughest of alloys—principally SAE-3312 and SAE-4340."

Many of the parts are machined after heat treating to hardnesses as high as 50 Rockwell C. Both high speed and tungsten carbide tools are used. All the conventional and some very unconventional turning operations are performed using the complete double range of speeds and all the feeds.

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC) LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.
L & S LATHES
CINCINNATI 25, OHIO, U. S. A.
MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

Fray "All-Angle" Attachments Made in 4 Sizes for Millers

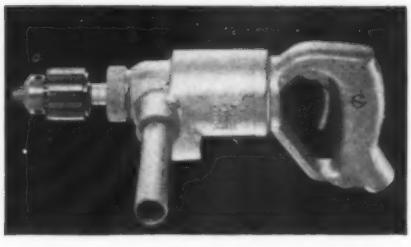


The "All-Angle" milling attachment made by the Fray Machine Tool Co. has been improved and is now manufactured in four sizes. The attachments are distributed by H. Leach Machinery Co., 387 Charles St., Providence 4, R. I.

The Type 1 attachment weighs 105 lb. and has a ½-hp. motor. The three larger sizes are all of the quill type. Type 2 weighs 115 lb., has a ½-hp. motor and a 3½-in. quill travel. Type 3 weighs 140 lb., has a ¾-hp. motor and has 3½-in. quill travel. Type 4 weighs 275 lb., has a 1-hp. motor, and 4-in. quill travel.

All attachments have six spindle speeds varying from 375 to 5200 rpm., except Type 4 which has six speeds varying from 300 to 3050 rpm.

Rotor Tool's Small Air Drills Can Be Used for Nut Setting



Two small air drills, the Midget type M-850 and the E-O-M-1100, are announced by the Rotor Tool Co., Cleveland, Ohio.

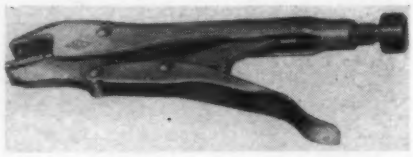
The Midget type has a capacity of 1/16, 1/8, and 3/16 in. for drilling and light screwdriving and nut setting. The E-O has a capacity of ¼, 5/16, and ⅜ in. for drilling, and for setting nuts and hex-head machine screws in carbon steel.

Both types are available with double adjustable clutches. The torque of the air motor drives the nut down, then the clutch gives three impacts per revolution to set the nut or screw to a pre-determined tension. The E-O, which is illustrated, is equipped with spade handle only or spade handle and auxiliary side handle.

Willey's Universal Protractor Permits Dual Angle Settings

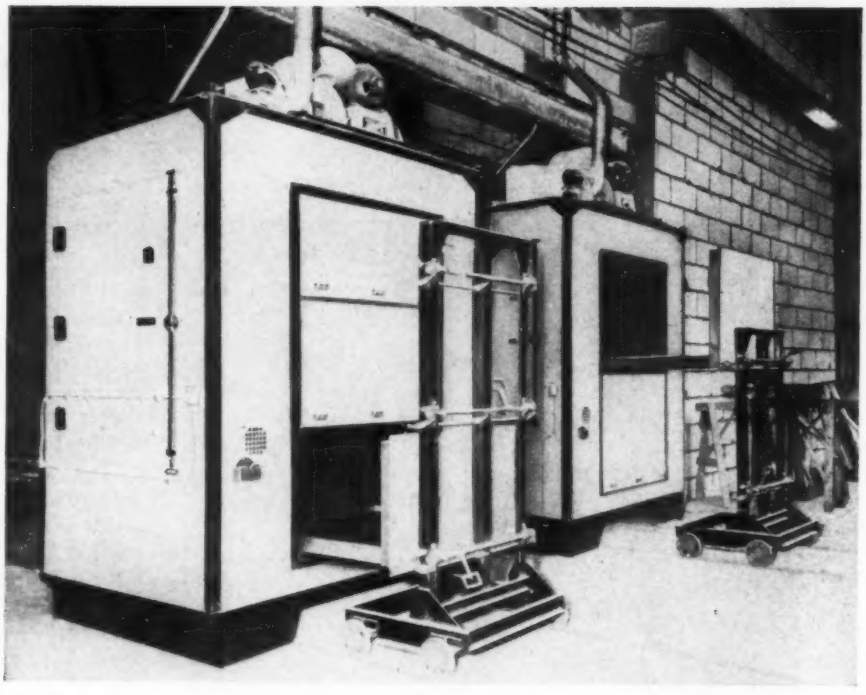
A universal angle protractor which can be used on all carbide tool grinders is announced by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1, Mich. It provides a dual change of angles from 0 to 90 deg., permitting the grinding of two tools simultaneously at the same or different angles.

The protractor can also be used for operations such as acting as an angular guide for drilling, grooving, and milling.



HANDY WRENCH—Toggle action enables a new wrench made by A. C. E., Inc., Transportation Bldg., Detroit 26, Mich., to be used as a combination straight, end or pipe wrench vise, toggle press clamp or pliers. Jaw opening is 1¼ in.

Superstructure Eliminated In Gehnrich Pull-drawer Ovens



A new type of pull-drawer oven, made by Gehnrich Oven Division, W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn., for processing batches of work by drawer, features elimination of structural steel overhead track and oven reinforcement. Now the drawers are supported on a puller mechanism set on a channel iron base frame which rides on ball bearing wheels in a track guide on the plant floor. The puller engages any one or all the drawers and its base projects no more than 15 in. in front of the bottom of the oven bottom. Fans, heaters and motors may be set directly on the oven roof, reducing over-all equipment height for the oven.

Heat is supplied by electric heaters nested at one side and baffled from the heating chamber. A side door facilitates inspection and service. If gas, oil or steam heating is desired, an air heater may be installed on the oven roof, or gas or oil burners may fire into a combustion chamber.

How to get Standard and Special Gages Quicker

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SPECIAL TAPS IN STOCK (IMMEDIATE DELIVERY)
RH & LH Taps with ODD PITCHES in both MACHINE SCREW and FRACTIONAL sizes
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ST'D THREAD GAGES IN STOCK (IMMEDIATE DELIVERY)
See pages 2 and 3
On OTHER PRODUCTS SEE TABLE BELOW for current Delivery Quotations
TOOLS & GAGES DELIVERIES
SPECIAL THREAD PLUG GAGES 1-2 weeks
SPECIAL THREAD RING GAGES 2-3 weeks
STANDARD TAPS (When not in stock) 2 weeks
SPECIAL TAPS 3-4 weeks
STANDARD THREAD MILLING CUTTERS (From Stock Blanks) 1 week
SPECIAL THREAD MILLING CUTTERS (Natl. Form) 3-4 weeks
SPECIAL THREAD MILLING CUTTERS (Spec. Form) 4-5 weeks
THREAD CHASER BLADES 3-4 weeks
MACHINES
TAP RECONDITIONERS 2-3 weeks
LIGHT DUTY TAPPING MACHINES 2-3 weeks
HOB HOOK & SPACING CHECKER 4-5 weeks

BALTIMORE 21, Md.....ESsex 2366
BIRMINGHAM, Ala.....Birmingham 7-1017
BOSTON 16, Mass.....LIberty 9398
BUFFALO 2, N. Y.....GRant 6601
CHICAGO 12, Ill.....KEdsie 3170
CINCINNATI 2, O.....MAin 2544
CLEVELAND 13, O.....CHerry 3520
DAYTON 2, O.....FULton 6161
DENVER, Colo.....KEystone 7229
DETROIT 11, Mich.....MAdison 0260
FLINT, Mich.....Flint 4-2624
HOUSTON 2, Tex.....FAirfax 1426
INDIANAPOLIS 9, Ind.....FRanklin 2456
LOS ANGELES 37, Calif.....ADams 1-4381
MILWAUKEE 2, Wisc.....DAily 4256
MUSKEGON, Mich.....MUskegon 248
NASHVILLE 6, Tenn.....Nashville 6-3647
NEWARK 2, N. J.....MArket 3-1493
PITTSBURGH 19, Pa.....ATlantic 3011
PORTLAND, Ore.....VErmont 2334
ROCKFORD, Ill.....MAin 2243
ST. LOUIS 1, Mo.....CEntral 4435
SAN FRANCISCO, Calif.....DOuglas 7711
SEATTLE 9, Wash.....MAin 6427
SOUTH BEND 3, Ind...South Bend 3-0009
SPOKANE 8, Wash.....MAin 2191
SYRACUSE 9, N. Y.....SYracuse 8-1462
TOLEDO 4, O.....GArfield 8302
MONTREAL, Canada.....MAin 5346
TORONTO, Canada.....WAverly 2688
WINDSOR, Canada.....Windsor 4-9229

The quickest way is to call the Detroit Tap representative in your area. He has readily available up-to-the-minute stock lists of Detroit thread plug and ring gages. You can obtain a copy immediately and a revised copy every two weeks by phoning him today.

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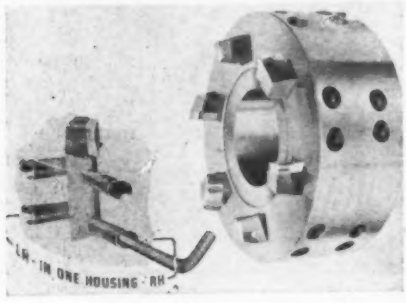
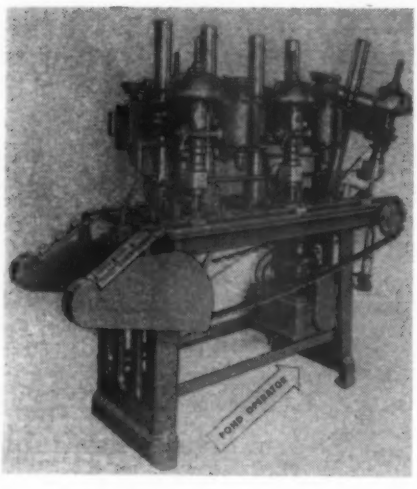
Left- or Right-Hand Blades Used in Lovejoy Face Mill



A face mill which will take either left- or right-hand blades, the "Cuts-all" is announced by Lovejoy Tool Co., Springfield, Vt. Designed for cemented-carbide blades, it holds the blade face slightly back of center so that positive and negative radial rake can be obtained from the same blades. The blades have large Carboloy tips and can be sharpened on an off-hand, adjustable table single-point tool grinder the same as regular lathe tools.

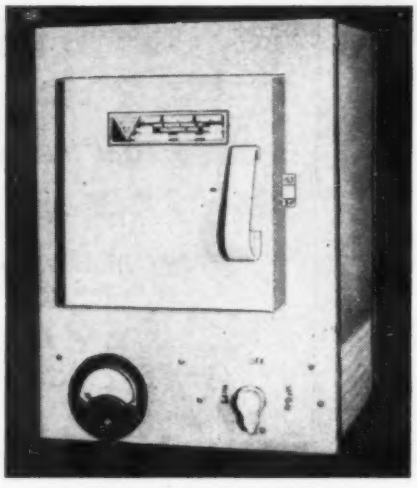
The tool is available in 6-, 8-, 10-, and 12-in. dia. sizes. The same blade size fits all cutter sizes.

Pond Operator Automatically Controls 5-Spindle Tapper



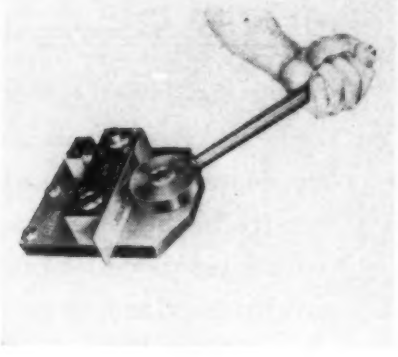
An automatic control unit, developed by Pond Engineering Co., Springfield, Mass., enables 5 drill spindles to be mounted and operated on 3-spindle tables. Two chain conveyors carry the pieces on equally-spaced carriers across the table and under the machine. Pieces arrive under the spindles at equal time intervals. Tapping heads, fitted to each spindle, are actuated simultaneously so that 5 holes are tapped at one cycle. This operation requires that two different pieces be handled simultaneously—one having 3 holes to be tapped, the other two. The conveyor drops the stampings into containers at the other end.

The Pond Operator is powered by a 1/3-hp. motor and is motivated mechanically by a gear-driven, clutch-connected camshaft and by 4 small air valves. Mechanical cams and more air valves may be added by extending the cam shaft outside the housing. Cycle speed is adjustable from 2 sec. to one minute.



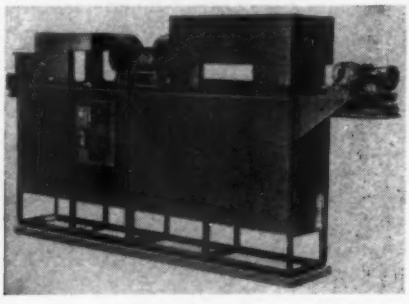
SMALL FURNACE—Pereco Model 220-W furnace utilizes temperatures up to 1850 F. Produced by Pereny Equipment Co., 842 N. Pearl St., Columbus, Ohio, the furnace operates on 115 volts, drawing 1500 watts

Acromark Bench-type Marking Unit Design For Flat Parts

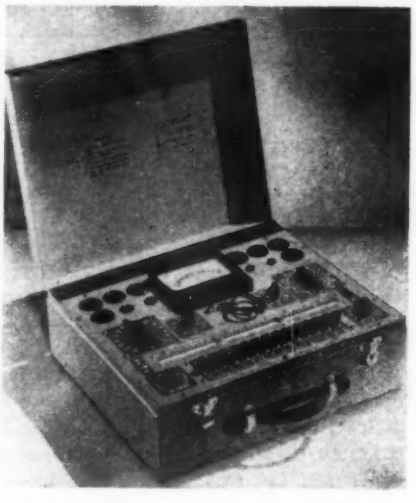


Although Model 920 Hand Marking machine was made by The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J., for marking flat parts a simple change in construction enables it to mark round parts. Working adjustment is obtained by means of a screw and lock-nut, set beneath the locking bolt end of the arm. A steel stud at the top of the casting carries the sleeve bearing mounted roller marking die.

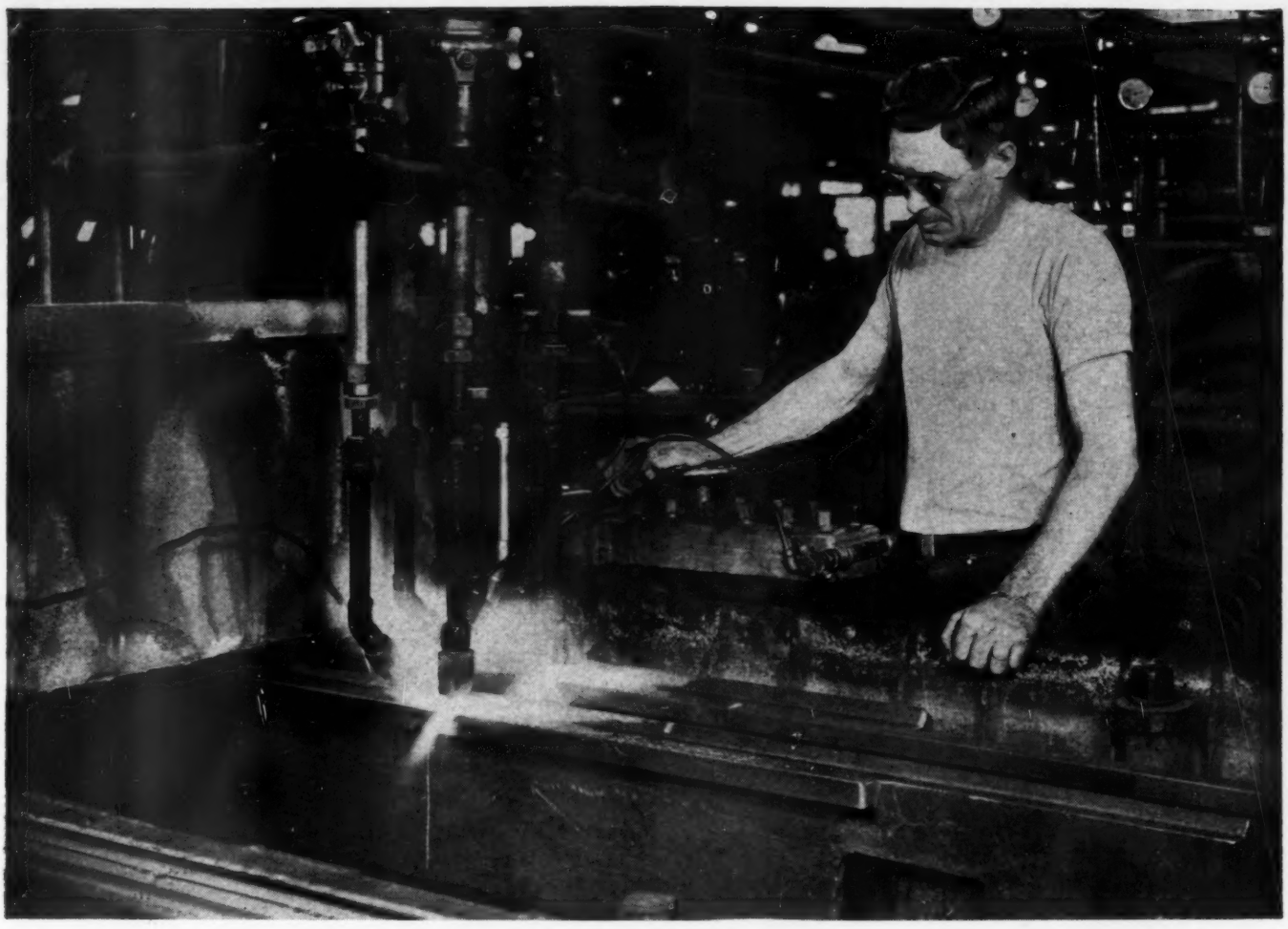
Optimus Continuous Dryer Is Effective with Hot and Cold Air



A cold and hot air dryer, designed to continuously dry loaded racks before and after plater or water solution dips is announced by Optimus Equipment Co., 107 Church St., Matawan, N. J. Fumes are drawn off the dryer by an exhaust blower. Steam, gas or electricity may be used and drying takes from 4 to 6 min. It can be used as a single-stage dryer for a number of successive operations, alkaline, acid or neutral. The cold air system includes a blower and a series of nozzles. The hot air system includes an air heater, re-circulating blower and, a damper to adjust the mixture if atmospheric air and re-circulated air.



TUBE TESTER—Counter type 139 and portable type 140 electron tube testers for industrial applications are announced by Radio Tube Division, Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y. Both instruments are rated at 20 watts



This Flame Hardening Keeps Monarch Lathe Ways "Good as New"—EVEN AFTER 1,090,000 CYCLES

". . . This fine tool was used in shell manufacture and during its time in use, approximately one year, turned the burr ring on one million, ninety thousand shells. In examination of the machine, we find the ways as good as new although the movement of the carriage was confined to a short space. This seemed amazing to us after our experience with the older types of construction."

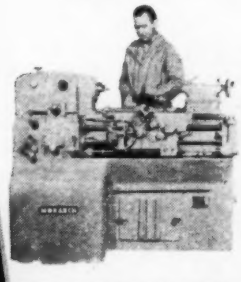
That's unsolicited, written testimony about a standard Monarch 10" EE Toolmaker's Lathe. What wasn't known is that such performance records are the *accepted*, rather than amazing, experience—for thousands of Monarch users everywhere.

More than 21,000 lathes have left our plant with flame-hardened ways since we first introduced the process for machine tool applications, back in 1937. It's one of the many plus features of Monarch Lathes—features that enable you to produce more for less. We'd welcome the opportunity to show you how Monarch can meet your metal-turning needs. May we talk it over?

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, O.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

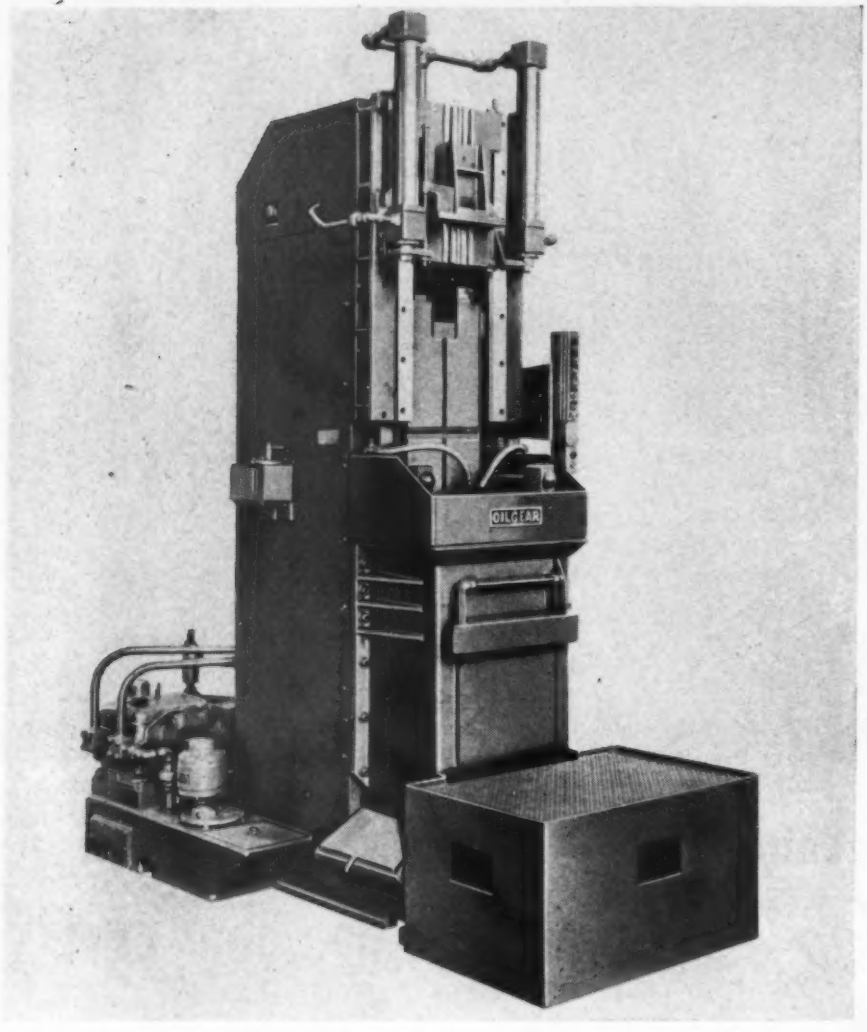


10" EE TOOLMAKER'S LATHE

Flame-hardened ways are one important reason why you'll get longer life and greater accuracy in this sensitive precision machine. For complete information and detailed specifications, ask for bulletin No. 10-EE.

YOUR PROOF OF PROTECTION— FOR LONGER LATHE LIFE

Oilgear's XP Vertical Broaches Include Automatic Tool Handling



Automatic pressure lubrication of tool slide, carriage and ways is included in this new line of vertical pull-down broaching machines

Vertical pull-down broaching machines, Type XP, are announced in five sizes by the Oilgear Co., 1301 W. Bruce St., Milwaukee 4, Wis. The machines vary in normal pulling capacity from 5 to 37½ tons and broaching strokes from 24 to 66 in.

The machines have automatic tool handling mechanisms with adjustable brackets for tools of varying lengths. Automatic puller operation, interlocked operation of tool handling carriage and tool pulling slide are among the other features.

Each machine is equipped with a Type DX two-way variable-delivery heavy-duty radial-piston fluid power pump for direct drive which provides variable broaching speeds up to 30 ft. per min., and return speeds up to 80 ft. per min.

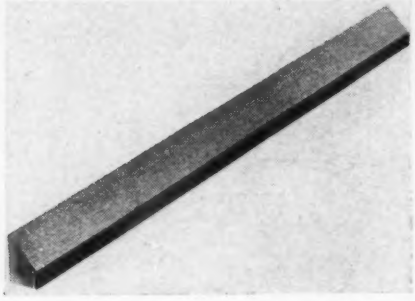
When broaching, the operator only loads and unloads the work and depresses the control. The upper carriage and tools descend to insert tool shanks through the work and table into pullers. The main slide automatically pulls the tools downward through the work and stops. The work is unloaded, the operator depresses pushbuttons, and the main slide and tools return upward, the upper carriage receives tools and lifts them upward to loading or starting position.

Yankee Electronic Gage Head Is Self-Contained Gage Unit

A new electronic self-contained gage head is announced by the Yankee Precision Products Co., Dept. AM-9, 50 Bartholomew Ave., Hartford, Conn. It can be connected directly to 110-volt circuit without the use of transformers.

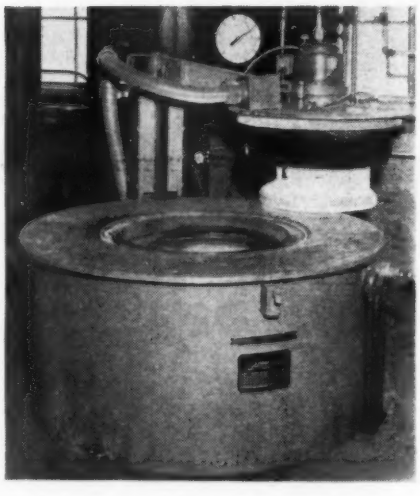
The gage head, complete within itself, can be attached to a support or stand to suit any specific application. The plus and minus lights will operate within a gage setting of 0.00001 in. Adjustment of the plus and minus setting is accomplished through a differential screw.

Angular Straight Edge Made by Machine Products

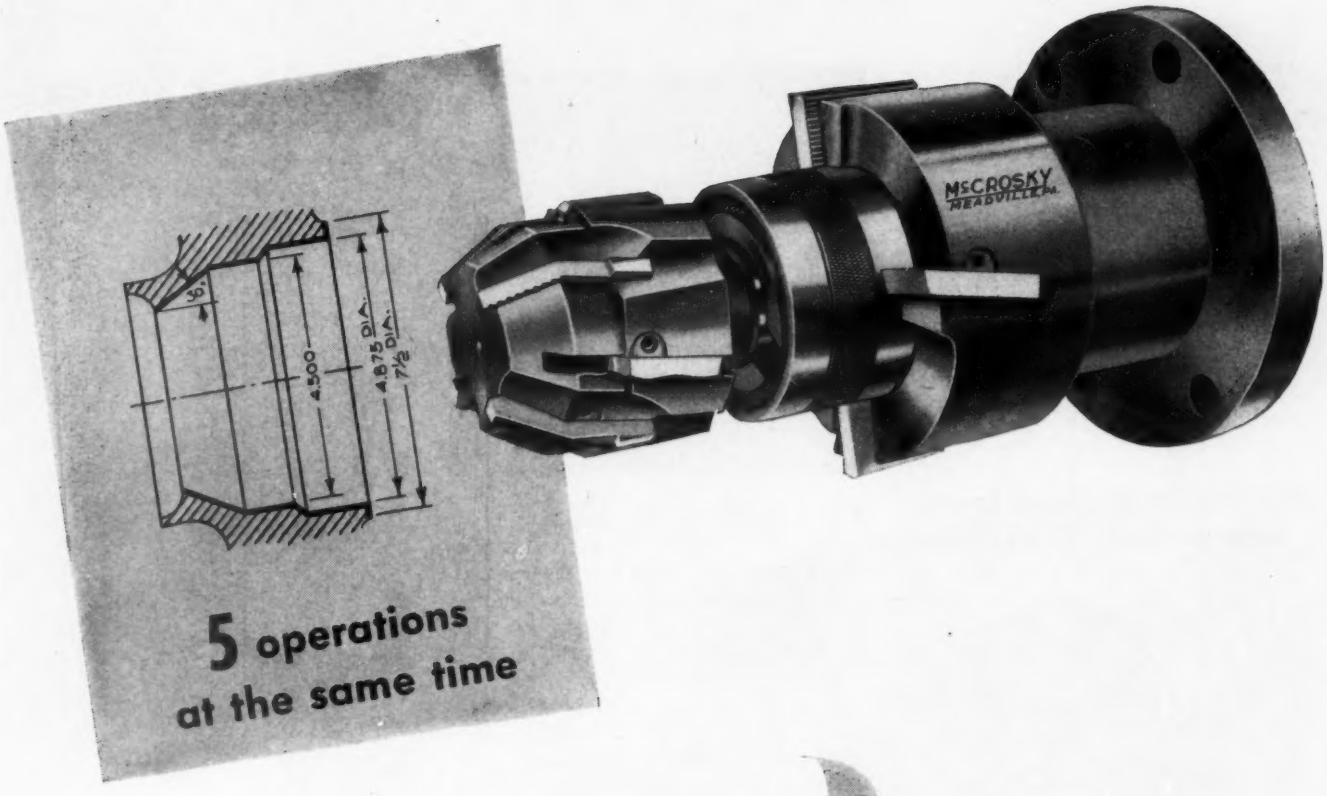


An angular straight edge has been developed by Machine Products Corp., Detroit, Mich. It is made of heat-treated Meehanite in any size from 18 to 84 in. in length, with any angle desired. Two faces of the straight edge are hand-scraped. It can be used with or without handles at each end.

GE Gas Carburizing Furnaces Use Fan to Distribute Gas



A line of gas carburizing furnaces in which a fan located on the furnace cover distributes the carburizing gas through the charge, is announced by the Industrial Heating Div., General Electric Co., Schenectady, N. Y. The electrically-heated furnaces are cylindrical with maximum temper-



McCROSKY *Multiple Operation* TOOLS...

Reduce Machining Time • Speed Production • Assure Absolute Uniformity and Concentricity of the Finished Work • Save Floor Space • Cut Costs

● Combining 2, 3, 4, 5 or even more boring, counterboring, facing, chamfering, reaming and other related operations, McCrosky Multiple Operation Tools are individually and painstakingly engineered to the individual job and work conditions,—pay their way on short or continuous production runs.

Use of McCrosky's Jack-Lock wedge and other ingenious and exclusive McCrosky blade locking and blade adjusting devices, give McCrosky Multiple Operation Tools the strength and rigidity of solid tools on the job, yet permits them to be adjusted, reground, or rebladed, easily and quickly, assuring outstanding efficiency and performance.

Send for Bulletin No. S-17. It illustrates and describes more than 40 McCrosky Multiple Operation Tools,—diagrams the work they do,—and may suggest related operations in your plant too, that can be combined with a McCrosky Multiple Operation Tool, speeding up production and cutting costs.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

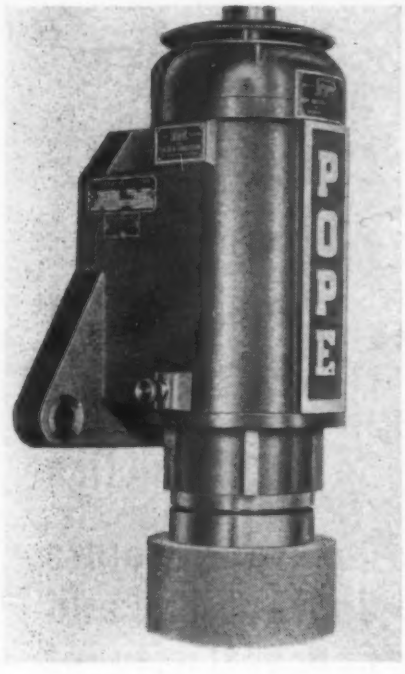
Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers
Block Type Boring Bars — *Turret* Tool Posts
Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

atures of 1800 F. possible in them.

The three furnaces in the new line are rated at 59.5, 77.5 and 110 kw. They are suitable for carburizing such work as gears, splines, fins, and bearing races. Tanked propane or natural gas is admitted to the furnace retort as the carburizing medium. A 1½-hp. fan is used on all three sizes. The furnace cover, which is lifted hydraulically, is provided with guides which prevent it from being lowered unless it is in proper position for sealing.

Pope Vertical Motorized Spindle Made for Rough, Finish Grinding

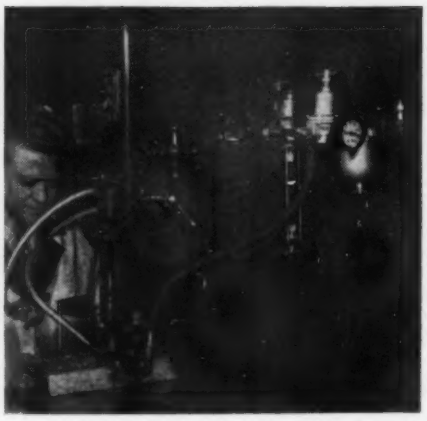


A vertical motorized spindle for use on surface grinders and other machines is made by Pope Machinery Corp., 261 River St., Haverhill, Mass.

It is equipped with a fan-cooled, totally inclosed motor of 3, 5, or 10 hp., operating at 1200, 1800, or 3600 rpm. Lubricant is sealed in the spindle for the life of the bearing. The spindle is designed to rough off surplus material fast and for precision finish grinding.

DoAll Bandsaw Spray Lubricator Directs Metered Mist on Teeth

A spray lubricator that provides heat dissipation on their high-speed bandsaws is announced by the DoAll Co., 1301 Washington Ave. South, Minneapolis 4, Minn. The unit operates from the standard air-pressure



line available in most machine shops.

The spray head straddles the saw blade from the back side and directs twin streams of lubricated air against the teeth of the saw. This lubricant, quantity of which is regulated by a metering valve, is forced as a mist into the saw teeth as they enter the work. The unit is designed primarily for non-ferrous metals, but can be used on plastic materials where friction softens the material to a gummy state. The unit is said not to make the work table wet or messy.

Lyon-Raymond Elevating Table Has Telescopic Lift Cylinder

A telescopic cylinder has been developed for the hydraulic elevating table made by Lyon-Raymond Corp., 2775 Madison St., Greene, N. Y.

This cylinder makes possible an elevating range from 28 to 50 in., lifting 22 in. The greater range of elevation permits leveling with press beds and storage racks in handling dies, jigs, and fixtures. Except for cylinder and guide sleeves, standard elevating table parts are used.

Yankee Precision Products Gage Has Electronic Head, Snap Frame

An electronic snap gage for production inspection has been made by the Yankee Precision Products Co., 50 Bartholomew Ave., Hartford 6, Conn., by mounting the recently developed electronic gage head on snap frames. For inspecting small parts the unit can be mounted on a stand.

The gage is operated on 110-volt, 60-cycles, single-phase alternating current. Sizes up to 3 in. are standard with 100-in. range in each size. An indicator can be mounted in the frame if readings are wanted.

Drennan Universal Positioner Balances Work; Can Be Rotated

A device designed to position work for welding, brazing, or assembling, the Universal Balanced Positioner, is announced by Lee J. Drennan, Inc., 430 Main St., Arcade, N. Y.

The principle of operation is to

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS SCREWS give all these savings:—

...in your hands

American Phillips Screws begin your savings with *speed of handling* . . . which means firm fit of the 4-winged Phillips Driver into the engineered, tapered recess. And American Phillips Screws build up your savings with *automatic straight-driving accuracy,* assured by the fact that screw and driver form one single, straight-line unit. *Assembly costs drop 50%.*

And American tops your savings above all others by its special knowledge of metals . . . not only brass, and bronze, but stainless steels, monel, aluminum, everdur. Bring your fastening problems to the "Information Center," and get extra, engineered savings from the greater metallurgical "know-how" of American Phillips engineers.

...in your customers' hands

American Phillips Screws are more than sales promotion . . . *they are sales protection.* For products assembled with these good-looking, vibration-resistant fastenings are the products that *last.*

Users don't have to leave a vac (or any other Phillips-assembled product) idle because a "screw is loose somewhere." American Phillips Screws hug up tight and flush . . . and stay there for the life of the product.

If *you* use American Phillips Screws in *your* product, merchandise them for all they're worth—*and they're worth plenty!*

If you aren't using them . . . add them now to *your* sales promotion program.

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AMERICAN PHILLIPS *Screws*

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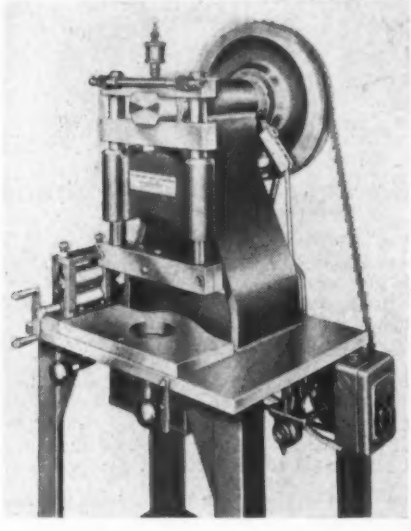
ALL METALS: Steel, Brass, Commercial Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

align the center of gravity of the work mounted on the balance arm with the centerline of the balance head through which the arm rotates. Work when secured in this manner can be moved by finger-light pressure to any degree of angularity in the horizontal or vertical plane.

Horizontal rotation is accomplished through the spindle head, and vertical rotation is accomplished through the balance head. The ball joint affords approximately 40° movement of the balancing arm for balancing work, with this adjustment accomplished by two adjusting nuts. It is said to be possible to balance work in a few minutes. The Model 1000 positioner handles a maximum load of 400 lb. A larger model is under development.

High-speed Peterson Punch Press Makes 200-500 Strokes Per Min.

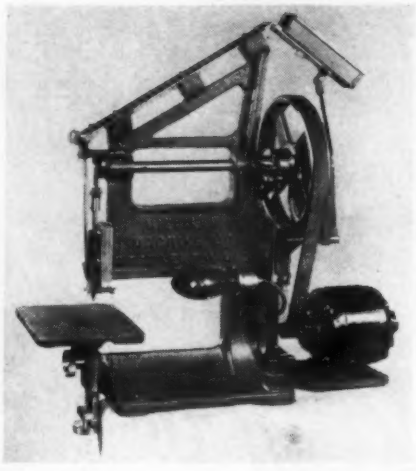


With speeds that can be varied from 200 to 500 strokes per minute, the "Hi-Speed" Peterson punch press, made by Woolley Div., Hammel-Dahl Co., 233 Richmond St., Providence 3, R. I., is capable of producing 30,000 stampings per hour.

The improved model uses a ¾-hp. motor operating at 1750 rpm. The machine has centralized lubrication, with one oil cup handling the entire machine. Micrometer adjustment for the punch is included, and a friction feed with micrometer adjustment for close setting. The feed is adjustable from 0 to 2 in. per stroke of press.

Milliken Nailing Machine Used for Assembly Operations

A precision nailing or pinning machine which replaces hand assembly operations where small nails, pins,



rivets, or drive screws are employed, is announced by Milliken Machine Co. Hastings Sales Engineering Div., Boston, Mass.

The unit can be mounted on a portable workbench. It is driven by a ¼-hp. motor and can be modified to suit specific requirements. Nails can be angled, countersunk or partially inserted. The sustained driving action allows a nail to pierce aluminum, copper, zinc, lead, tin, thin sheet steel, and various plastic compositions without predrilling.

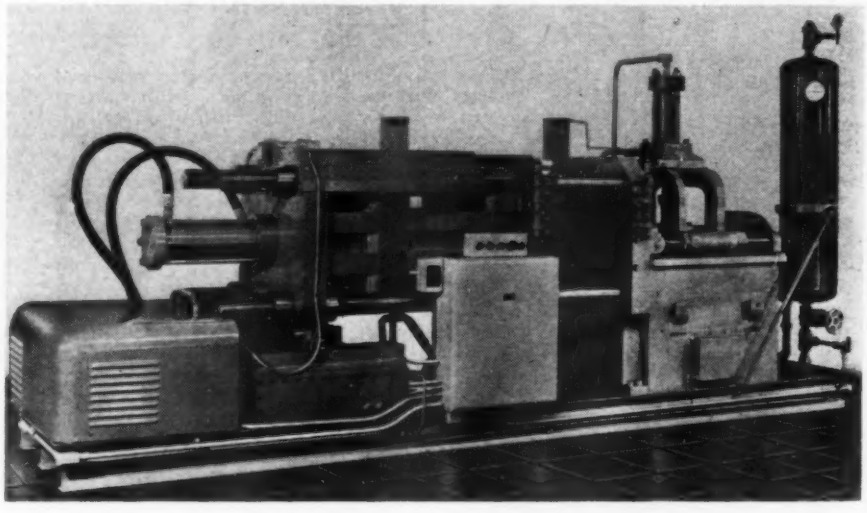
With the use of jigs or fixtures, small holes can be located for riveting such items as bearing assemblies.

Coulter Attachment for Hobbing Straight or Taper Tap Threads

Tap threads can be produced on the Type H hob-thread milling machine made by the James Coulter Machine Co., Bridgeport, Conn. with the aid of a new relieving attachment.

Taps with any number of flutes with eccentric or concentric relief can be produced. One revolution of the relieving cam generates one flute on either straight or taper taps. Relieving arm leverage is adjustable to give amount of relief desired.

Hydraulic Machinery's Die Caster Uses Gooseneck or Cold Chamber



A "Deoxidizer" is included on models for zinc-alloy die casting to reduce dross as much as possible

A fully hydraulic, self-contained, die-casting machine for zinc, aluminum, and brass alloys, Model M-114, is announced by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich.

The machine is said to have a simplified arrangement for installation of the plunger without bolts or other loose parts used. The gooseneck design is improved and is said to eliminate sticking plungers. A new pot and gooseneck can be installed in a half hour.

The machine, which weighs approximately 16,000 lb., has a 10-in. die opening. The pressure applied is 6,000 psi. on zinc, and 16,000 psi. on aluminum and brass. The locking pressure is 400 tons. The melting pot will hold 500 lb. of zinc or brass, or 200 lb. of aluminum.

A complete unit, with cold-chamber arrangement of operation, is available for die-casting aluminum and brass alloys. The machine is constructed so that the change-over can be made in a few hours.

They make the lubricant last longer...

Yes, whatever the load, speed or service requirements of the installation, Torrington Needle Bearings help conserve lubricant... prolong its effective life.

That's because there is an extra margin of lubrication efficiency in Torrington Needle Bearings due to their basic design . . . *the turned-in lips of the hardened retaining shell which provide a natural reservoir for retention of the lubricant.* At the same time this same feature helps to exclude dirt and dust from vital bearing surfaces. The lubricant is kept clean and free from contamination. Consequently, bearing wear is minimized ...less frequent renewal or replacement of the lubricant is required . . . maintenance costs are substantially reduced.

If you are seeking an anti-friction bearing for an application where high capacity, small size and economical cost are important design considerations, Torrington Needle Bearings may be *your* answer! You'll find a wealth of pertinent data in our Catalog No. 32, available on request. If you have a specific application in mind, our engineering department will gladly give you specific recommendations.

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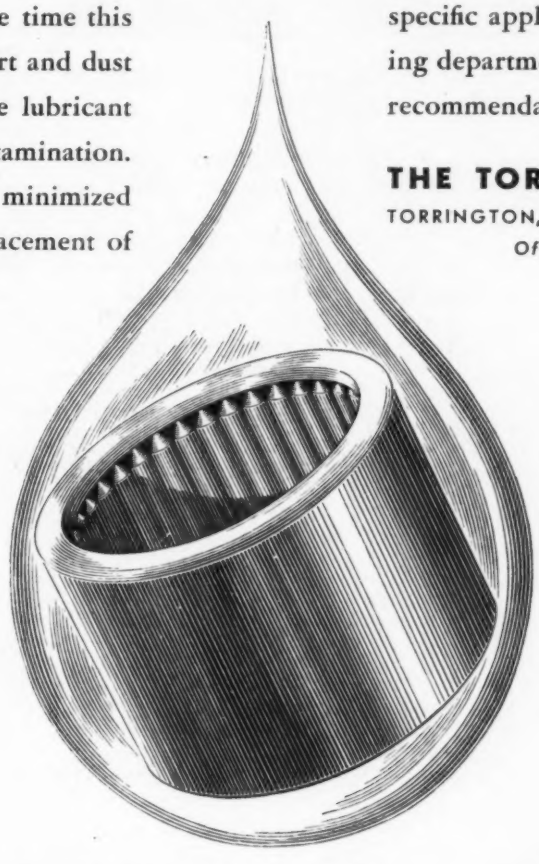
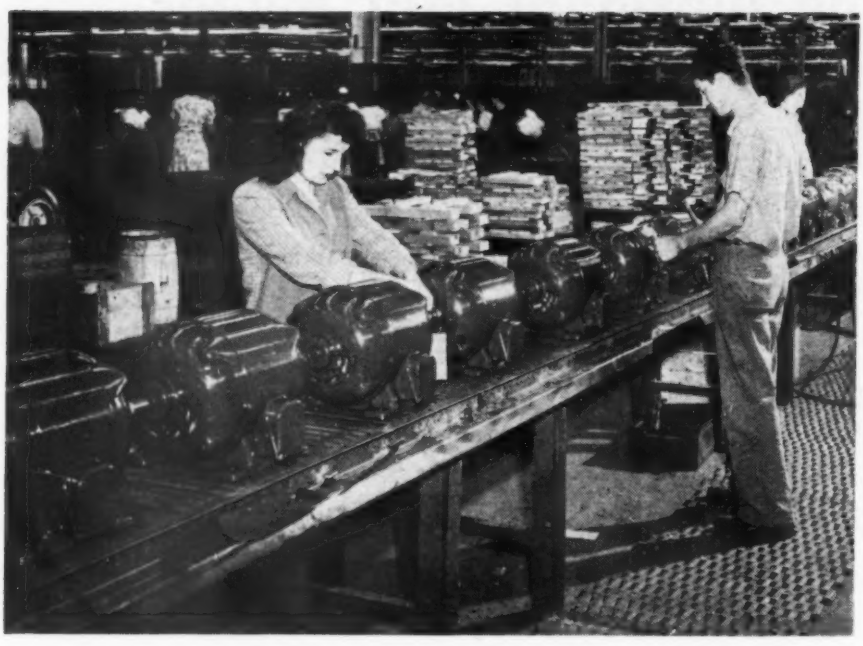


TORRINGTON NEEDLE BEARINGS

Parts and Materials

Westinghouse Life-Line Motors Use Steel Design; 35% Smaller



Life-Line motors on the finishing line at the new Buffalo plant are tagged for shipment. These are of the open-protected type

A new line of alternating-current motors more than 35% smaller than those they replace is announced by Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa. Known as the Life-Line, the new motor will be made in integral sizes from 1 to 300 hp.

Completely redesigned, the new motor accomplishes the size reduction without loss of electrical properties. Starting torques have been increased as much as 134% per lb. of motor, and maximum torques as much as 116% per lb. of motor.

The motor is being produced in a new factory in Buffalo. Production of the present line will be continued in the old plant until the new motor can be produced in quantity to meet requirements.

The Life-Line has a steel frame, made not of sheet steel but of steel sections the same thickness as previously used for cast iron. Tests are said to have indicated the corrosion resistance to be as good as cast iron. The motor is finished with base coats of baked thermoset varnish with a final coat of lacquer. For severe applications, stainless steel will be used for shields and hoods.

The steel frame has permitted smaller size because of the greater precision. Dimensions can be held more accurately and adequate clearances between windings and grounded parts of the frame can be held without the generous allowance required with cast iron.

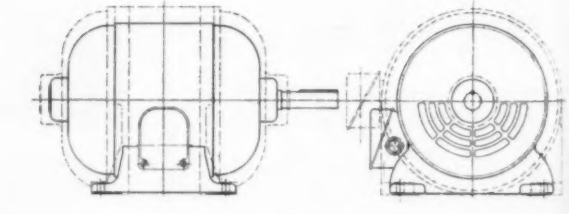
Extensive interchangeability of parts on several types of motors is possible. This simplifies manufacture and permits conversion by the user, if requirements change. The open-protected motor can be used for wall or ceiling mounting by orienting the brackets 90° or 180°.

To make a splash-proof motor, the brackets are oriented with openings facing upward and hoods are placed over the ends. To make a totally enclosed fan-cooled motor, a different set of brackets and hoods and a new blower are used. All brackets and hoods are identical at each end of the motor.

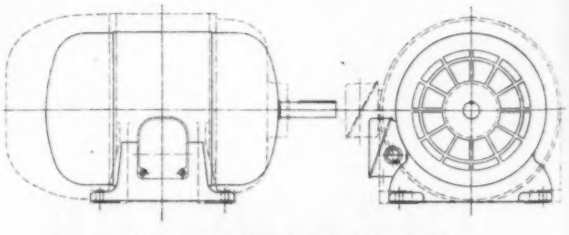
The conduit box may be reversed by reversing the frame on each of the three types.

Prelubricated ball bearings, pioneered by Westinghouse, are used throughout the line. They require lubrication no sooner than five years after placing in operation, and large numbers of motors with these bearings are said to have now operated for nine years without trouble or relubrication.

Most failures are traced to damage of insulation during the winding process or to faulty or inadequate insulation. On the redesigned motor slots and coils are designed to make winding easier with less handling of the coils and, consequently, less chance of damage.



OPEN-PROTECTED MOTOR



TOTALLY-ENCLOSED FAN-COOLED MOTOR

Dotted lines show sizes of the old Westinghouse induction motors, while solid lines indicate sizes of the new Life-Line. These are 7¼-hp. motors

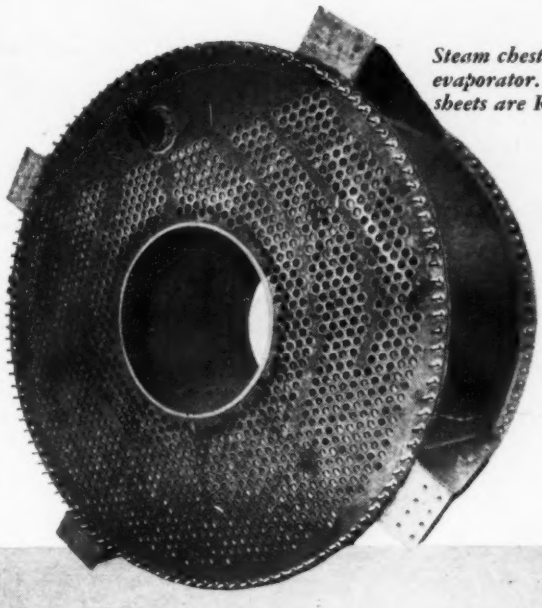
Skilful designers take advantage of REVERE'S many metals

THIS large evaporator equipment affords an excellent example of skilful designing to take advantage of the special characteristics of two of the Revere Metals. For high heat conductivity and corrosion resistance, Revere copper tube and tube sheets were used for the steam chest. For the strength of mild steel and the corrosion resistance of copper, Herculoy plates were used.

There are many different Revere Metals, because no one metal can possibly serve all purposes. The important thing is to select among these metals those most suitable for each given set of conditions. Sometimes this is not easy, requiring a skilful balancing of such factors as corrosion resistance, strength, weight, cost per pound, cost per cubic foot, cost of fabrication, time consumed in fabrication, service expectancy, and even appearance. We will gladly discuss with you the many, varied, and sometimes contrasted virtues of Revere Metals, either in general terms, or in relation to a specific product or piece of equipment.

Revere Mill Products include—*Copper and Copper Alloys:* Sheet and Plate, Roll and Strip, Rod and Bar, Tube and Pipe, Extruded Shapes, Forgings; *Aluminum Alloys:* Tube, Extruded Shapes, Forgings; *Magnesium Alloys:* Sheet and Plate, Rod and Bar, Tube, Extruded Shapes, Forgings; *Steel:* Electric Welded Steel Tube.

Catchall, 90" x 5' 5" face to face, made of Herculoy.



Steam chest of 11' ID x 30' 6" evaporator. Tubes and tube sheets are Revere Copper.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

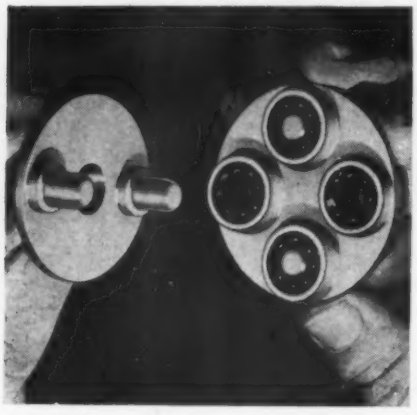
230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere

Listen to *Exploring the Unknown* on the Mutual Network every Sunday evening, 9 to 9:30 p.m., EST.

Evaporator equipment designed by the Zaremba Company, Buffalo, N. Y., for the Corn Products Refining Company and fabricated by Farrar & Trefts, Inc., Buffalo, N. Y.

Morflex Couplings Designed For Fractional-Horsepower Drives

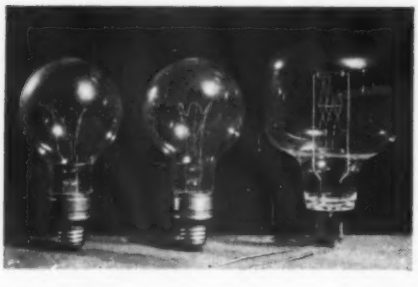


Small couplings, designed for low power-takeoff on fractional-horsepower drives, are announced by Morse Chain Co., Detroit, Mich. The units are available in two new sizes, handling 3 and 9 ft/lb torque and maximum rpm. is 3600 for both sizes. Stock bores are from ¼ to 1 in. A flexible Neoprene biscuit assembly shields machine installations from shock and permits slight angular misalignment of shafts while transferring maximum power.

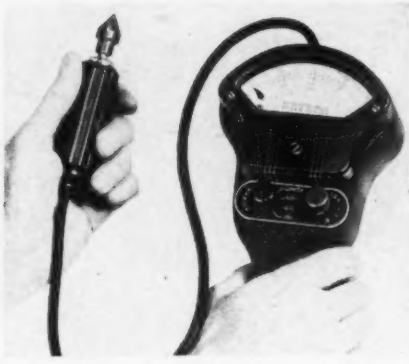
Trethaway Molding Alloy Melts at 430 Fahrenheit

An alloy for use as a molding material for casting plastics, rubber, and other material, called Moldaloy, is announced by Trethaway Associates, 37 Wall St., New York, N. Y.

Moldaloy melts at 430 F, has a hardness of 22 Brinell, compression of 8,000 psi., tensile strength of 11,500 psi., and shrinkage of approximately 0.001 in. per in.



INFRA-RED LAMPS—Three new infrared industrial lamps, announced by General Electric Lamp Dept., Nela Park, Cleveland, are (left to right) 250, 375, and 500 watt. The two smaller lamps, designed for open reflector ovens, are interchangeable. The 500-watt lamp has a medium bipost base and 6-in. flexible leads



TACHOMETERS — Direct measurement of speeds down to 10 rpm., and 1 fpm. are available with the type 25B low-speed tachometer made by Metron Instrument Co., 432 Lincoln St., Denver 9, Colo. Direction of rotation does not affect the reading

Beryllium-Copper Electrode Announced by Ampco Metal

A coated beryllium-copper electrode, known as Beryl-Trode, is the latest copper-base alloy electrode announced by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis. The electrodes have a medium weight, flux coating required for stabilizing the arc, flux oxides formed in the welding operation, and produce a dense deposit.

The electrode is designed to weld parts made of beryllium-copper such as resistance welding jaws, and seam welder wheels. They are used for joining, repairing cracks or defects in castings, and for building up worn surfaces.

The electrodes are made in 5/32 and 3/16-in. dia.

Simmonds Hydraulic Fuses Protect System If Line Breaks

Two types of hydraulic fuses have been developed by Simmonds Products, Inc., 21-10 49th Ave., Long Island City 1, N. Y. Both types serve as safety devices, designed to provide protection if there is a break in the hydraulic line.

The quantity measuring fuse is designed to shut off after a predetermined amount of fluid has passed through it, and give protection to individual actuating cylinders. The return flow fuse is designed to protect a section of, or a complete hydraulic system. Installed between the pressure and the return line it shuts off if a break in one of the two lines cause a pressure drop below predetermined values. Neither fuse affects normal operation of the system.

Johns-Manville Clipper Seal For Bearings Uses No Metal

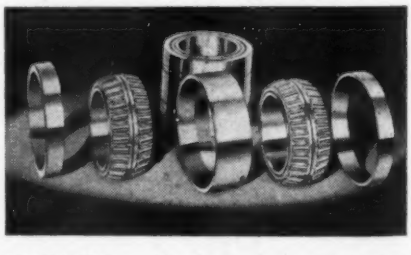
An oil seal packing for the protection of bearings which uses no metal, is announced by Johns-Manville Corp., 22 E. 40th St., New York 16, N. Y. The seal has a high factor of heel rigidity and a soft flexibility.

Known as Clipper Seal, it has a heel of resin-bonded fabric to give it the rigidity for a press fit in the cavity. The lip, made of a tough but soft flexible compound, is designed to vary the bearing area and control the pressure of the lip against the shaft by means of a garter spring. The seals are made in sizes for shafts from 1 5/16 to 37 in. in diameter, in both endless and split types.

Texas Co. Cleartex Cutting Oils Have War-Restricted Ingredients

A new series of transparent cutting oils, pale in color, with a pleasant odor and non-corrosive in high-temperature use, is announced by The Texas Co., 135 E. 42nd St., New York, N. Y. Known as Cleartex Cutting Oils A, A-1, B, and DD, and Britex Cutting Oil B, these products contain certain war-restricted ingredients which improve their color and performance.

The new oils contain a combination of sulphur and chlorine which permits high cutting speeds without corrosion. Color of the new oils equals pale neutral oils of the same viscosity.



BEARINGS — The 4-row taper roller bearings made by Kaydon Engineering Corp., Muskegon, Mich., have a high nickel content. Carburized with a deep case, this steel permits thinner cross sections in heavy-duty bearings

Fine Finish AT 400 S.F.P.M.

SUNICUT...

Eliminates Chatter Marks and Poor Finish, Cuts Down Rejects

A precision manufacturer was turning, boring, and threading small precision parts on Gridley automatics. Accuracy varied. Chatter marks frequently marred the work, and threads were poor. Rejects were too high.

Here are the facts:

Type of Machine: National Acme Gridley Automatic Screw Machine; 2⅛" capacity; Model R.B.; Six Spindles

Material Machined: Commercial Rod Brass

Speed: 400 Surface-Feet per Minute
Feed: .003"

Lubricant: Sunicut

A change to Sunicut was recommended by a Sun Cutting Oil Engineer. Chatter marks disappeared. Tolerances were maintained. Better threads were made possible, and rejects diminished, resulting in increased production.

The selection and proper application of the right oil always insure top performance. Test Sunicut in your own shop. It is a clear, transparent, sulphurized cutting oil, designed for high accuracy at high speeds on tough jobs.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

of the Sunoco News-Voice of the Air — Lowell Thomas

SUN

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INDUSTRIAL PRODUCTS

One Call—

for Varied Steel Requirements

Alloys, tubing, structurals, stainless—even with today's shortages one call takes care of many steel requirements when the call is to Ryerson.

One order and one invoice for varied production and maintenance needs makes the nearest Ryerson plant a time-saving source. Ten other Ryerson plants bring added convenience. When ordering for a distant operation you can deal with a familiar nearby source and have the steel shipped from the plant nearest the point of delivery.

Ryerson metallurgists and engineers, thoroughly familiar with the specialized steel requirements of your industry, will work with you on any problem of selection or application. Call Ryerson for prompt, helpful service on steel.

Joseph T. Ryerson & Son, Inc. Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL

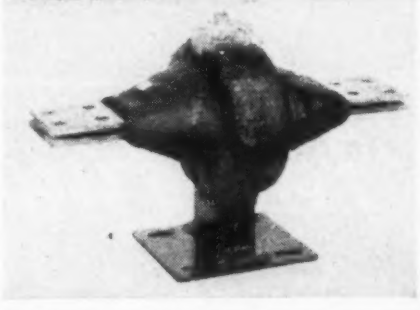
Speed Selector Uses Planetary To Give Stepless Speed Control

A Speed Selector unit, using planetary gears which provide stepless speed control from full down to zero and into full reverse at constant torque of 2-hp. capacity has been developed by Speed Selector, Inc., Cleveland, Ohio, and will be marketed by the B. F. Goodrich Co., Akron, Ohio.

Two standard V-belts and four variable-pitch pulleys are used to drive the two imput shafts of the planetary system. A slight change in the variable-pitch pulley brings a large change in output speed.

With the ratios equal the difference in input speeds, and hence the output shaft speed, is zero. If the ratio of one drive is greater than the other the output shaft rotates forward, and if the ratio is less, the output shaft operates in reverse. Speeds up to 400 rpm., forward and reverse, can be obtained.

Changes are made by a hand control wheel which alters the pitch diameter of the pulleys. Four and one-half turns of the control wheel gives the complete speed range of the selector.



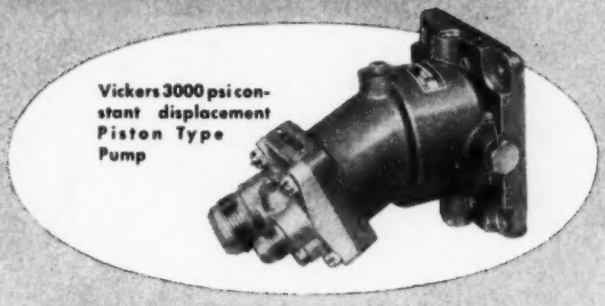
TRANSFORMERS — Two new current transformers for meter, relay, and control-device applications are designed for accurate metering over the normal current range. Made by Meter and Instrument Div., General Electric Co., Schenectady 5, N. Y., the JKL-3 is rated 5,000 volts and the JKL-4 (shown above) is rated 8,700 volts

Dayton Rogers Model L Cushion Mounted to Punch Press Bolster

An improved pneumatic die cushion, Model L, which may be mounted directly to the bottom of the bolster plate of the punch press is announced by Dayton Rogers Mfg. Co., 2835 12th Ave. S., Minneapolis 7, Minn. Four holes are drilled in the bolster plate to receive the supporting bars.

The unit can be provided with a mounting plate for press bed mount-

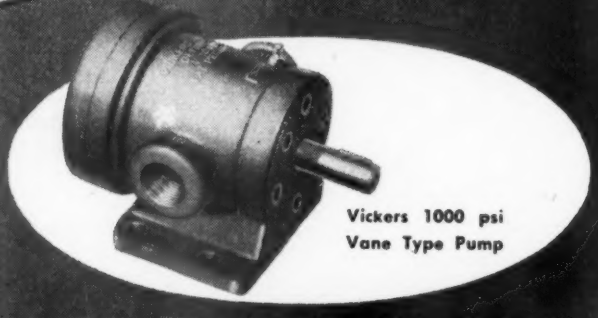
VICKERS Hydraulic Pumps



Vickers 3000 psi constant displacement Piston Type Pump

HIGH IN THE SKY — DEEP IN THE EARTH

Reliability with minimum weight . . . greater safety and longer life . . . are among the exacting requirements of the airlines. It is significant to designers and users of many other types of equipment that Vickers Hydraulic Pumps and Controls are widely used in the 3000 psi hydraulic systems of these huge planes that are literally writing new pages in aviation history.



Vickers 1000 psi Vane Type Pump

Huge cutting machines depend upon Vickers Hydraulic Pumps and Controls to speed the work and reduce the cost of mining coal. The operator controls the massive machine more easily than you drive your car.

Between these extremes, Vickers Hydraulic Equipment is serving industry in countless ways . . . wherever accurate, dependable and easy control is needed. In addition to the thousands of more widely known applications on metal working machinery, Vickers Hydraulic Pumps and Controls are used on construction equipment, motor buses, printing presses, agricultural machinery, marine equipment, oil well pumping units, textile and paper machinery, trucks, etc. Vickers Application Engineers will be glad to discuss with you how hydraulics can be used to your advantage.

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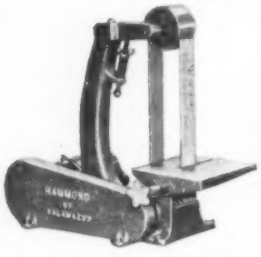
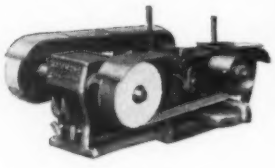
Hammond of KALAMAZOO

Abrasive Belt GRINDER-POLISHERS

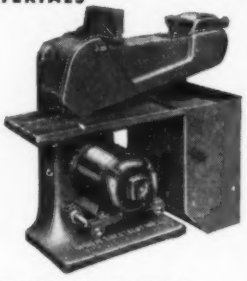
FOR FASTER GRINDING AND FINISHING OPERATIONS ON WOOD, METAL, PLASTICS AND OTHER MATERIALS



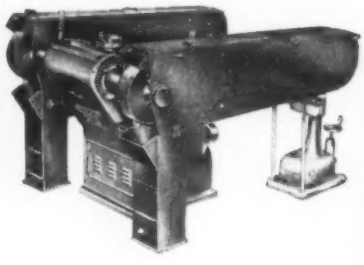
MODEL F-2 FLEXIBLE BELT — Especially suited for irregular shaped parts, eliminates costly hand filing.



MODEL NO. 5 DRI ONLY—UP TO 3" BELTS A popular hi-production grinding, polishing, buffing, deburring and brushing machine.



MODEL VH-6 WET-n-DRI, 6" BELTS — Vertical or Horizontal position. Other machines for up to 10" belts.



VARIABLE SPEED LATHE AND BACKSTANDS

Any speed from 1500 to 3000 RPM. Backstands can be purchased separately.

MODEL "400" WET-n-DRI, 4" BELTS Vertical or horizontal position. A popular belt grinder for finishing operations.

CARBIDE TOOL GRINDERS

PRECISION BUILT MACHINES WITH NEW OUTSTANDING FEATURES

10" WET and DRY CARBIDE TOOL GRINDER

No Spray — No Splash Guards, Safety Cup discs and heavy construction for fast, efficient grinding.

CARBIDE TOOL AND FINISHING GRINDER MODEL 6

For rough and finishing small tools and diamond wheel finishing of all size tools.

HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

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"We invite you to visit our Booth A-138, National Metal Congress, Atlantic City, where this equipment will be in operation."

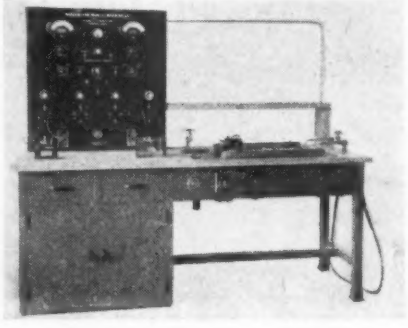
ing. The press bed mounting allows the operator to remove the bolster plate without disturbing the cushion installation.

An adjustable handwheel maintains the height of the hardened and ground pin pressure pad, making it unnecessary to correct the pin for length. A bellows-type cushion is used.

Promatic Electronic Timer Is Full or Semi-Automatic

An electronic timer, the Promatic, said to give highly accurate control under virtually any condition of temperature and humidity, is announced by General Control Co., 1200 Soldiers Field Road, Boston 34, Mass.

The timer allows either full automatic or semi-automatic control. A plug-in type condenser unit and a variable resistor with a graduated dial give control of the timing period.



ELECTROPLATING CONTROL — The Diggin electroplating control table, made by Hanson-Van Winkle Munning Co., Matawan, N. J., is a complete miniature plating laboratory for routine control of plating solutions or research. Test panels can be plated under closely controlled conditions

"Measuring at the Machine"
MINIMIZES PRODUCTION LOSSES!

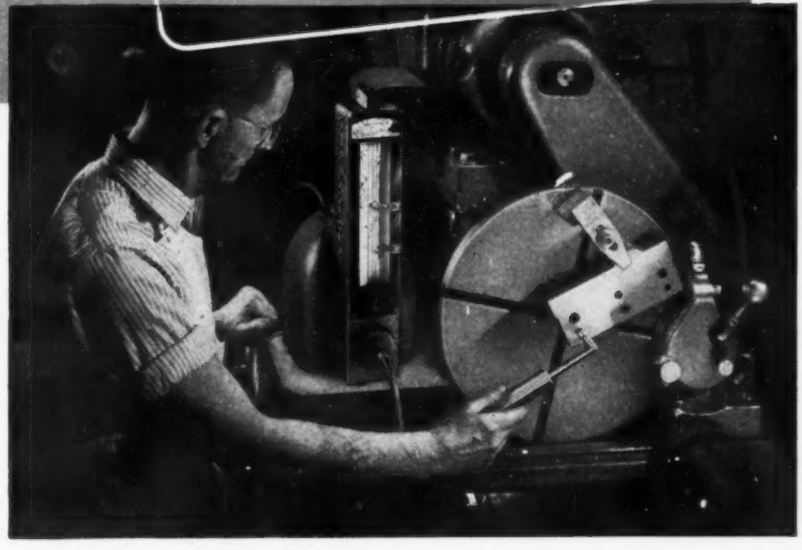
Reducing production LOSSES means reducing production COSTS. LOSSES usually occur at the machine—stopping such losses brings down costs.

"Measuring at the Machine" brings the following advantages which contribute to being able to sell a product profitably at or under competitive prices:

1. When accurate gaging is practiced right at the production machine, scrap losses have been reduced as much as 80% and 90%.
2. "Measuring at the machine" practically eliminates salvage work which is nearly always costly.
3. Component parts reaching the assembly line fit quickly and easily—no assembly time lost. Instead of working to the high limit as an operator normally does, he works to hit the part "on the nose."
4. When high production gaging instruments like the Multichek, Precisionaire and Visual Gage are used at the machine, the floor space devoted to inspection operations, gage maintenance costs and the labor cost of inspection are all greatly reduced.
5. Under close dimensional control, finished products give maximum performance, greater service life, and help build prestige for the manufacturer.
6. Fewer parts will wear out in service, and then replacement is quickly and easily done —no laborious fitting in the field will be necessary.

chek with Sheffield on "Measuring at the Machine"

1767



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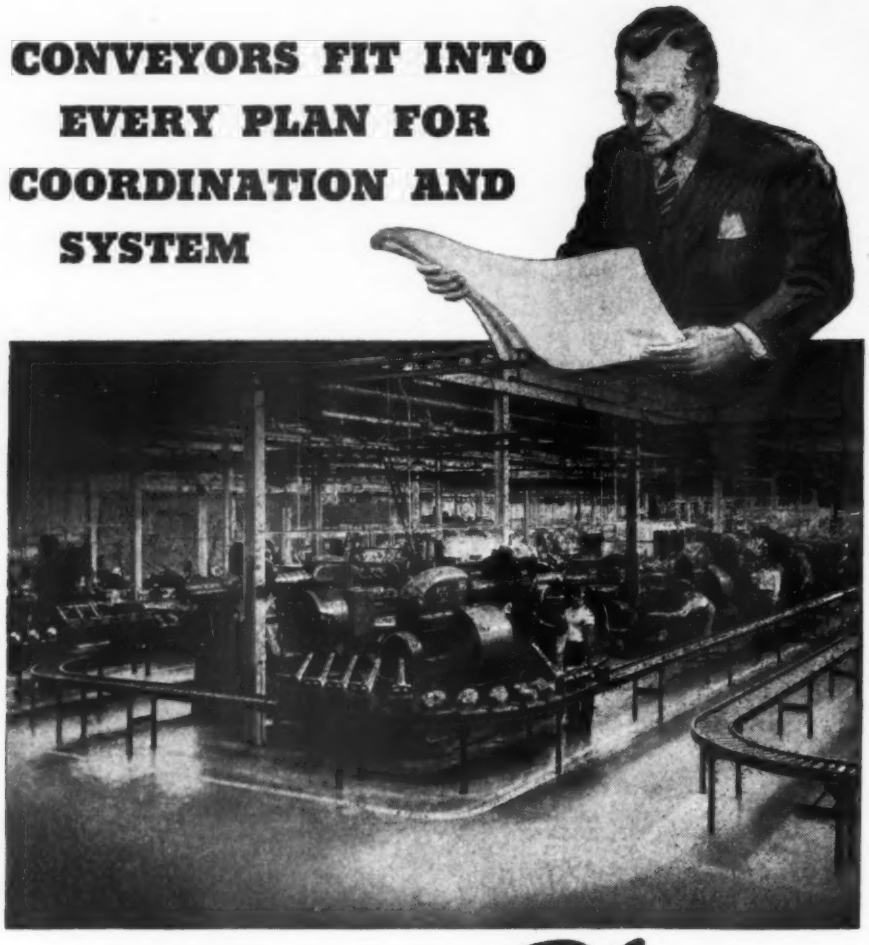
THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U. S. A.

MACHINE TOOLS...GAGES
MEASURING INSTRUMENTS
CONTRACT SERVICES

CONVEYORS FIT INTO EVERY PLAN FOR COORDINATION AND SYSTEM



...WITH THE *Plus* OF *FAST* LOW-COST HANDLING

Conveyors are an important weapon in your war on waste and inefficiency. They contribute substantially to the elimination of disorder and confusion—congestion—working hazards.

When you plan for faster, better organized production — check your plan thoroughly on the score of conveying and conveyors.

Why not check with Standard Conveyor—builders of an unusually wide variety of conveying equipment including power and gravity conveyors in belt, roller, chain and slat types, spiral chutes, piling and lifting machines, pneumatic tube systems.

Whether commodities — boxes, cartons, parts, units, packages—have to be moved in a straight line, a curve, up, down, or across, there is Standard equipment to do the job, developed in more than 40 years of service to business and industry.

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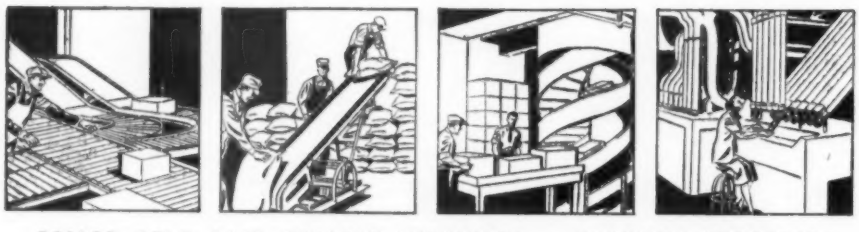


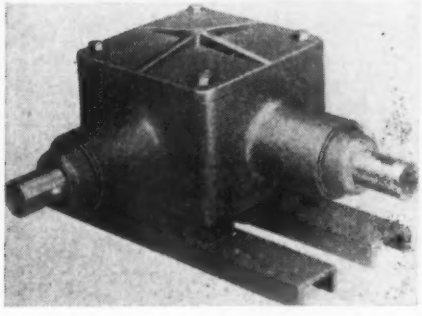
ROLLER · BELT · SLAT · PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

Jessop Has Vee-Oginizing Process Said to Stop Carbide Segregation

A new method of processing high-speed steel rounds in diameters greater than 4 in. said to prevent carbide segregation in the central portion of the round, is announced by the Jessop Steel Co., Washington, Pa., in collaboration with the Barium Steel and Forge Co., Inc., Canton, Ohio.

The new process is known as Vee-Oginizing. The Vee-Oginized steel has a uniform carbide distribution throughout, eliminating the brittle carbide pattern found in large rounds of high-speed steels.

Payne Dean Angle-Drive Unit Can Be Used In Any Position



An angle-drive unit developed for slow speed and high torque for intermittent operation is announced by Payne Dean & Co., Madison, Conn. The unit is intended for control of oven doors, valves, and similar operations.

Gears are of the straight-bevel type with 1 to 1 ratio. The shafts operate in grease-lubricated bronze bearings. The machine may be used in any operating position.

Two sizes are available with capacities of 1000 and 4000 in.lb. for 5 min. operation.

Airco Electrode Meant for Use When the Weld Fit-up Is Poor

A general purpose, mild-steel electrode which produces a weld metal of high mechanical property, Airco No. 87, is announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

The electrode is said to be especially suited for single- or multiple-pass welding on plates or sections where the fit-up is poor, or the work is rusty or dirty. An extruded-coated rod, the electrode characteristics are substantially the same when using dc. straight polarity, dc. reverse polarity, or ac.

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ives Specific Production Facts and Figures

llustrates Wide Range of Sizes and Shapes Possible

A Real "Idea-Starter" That Pays Dividends!

This little book is a remarkable *idea-starter*. It may actually lead to increasing die life in your plant as much as 133 times!

As you leaf through its pages—reading the methods whereby others are ringing up amazing production increases—you begin to see possibilities of doing the same in *your* plant. You're pretty sure to get some good ideas on how you can obtain results like these:

Production stepped up from 700 pieces to 100,000, for one manufacturer. Die servicing cut 95% for another. Die life increased from 20,000 pieces-per-die to 250,000 for another—to name a few.

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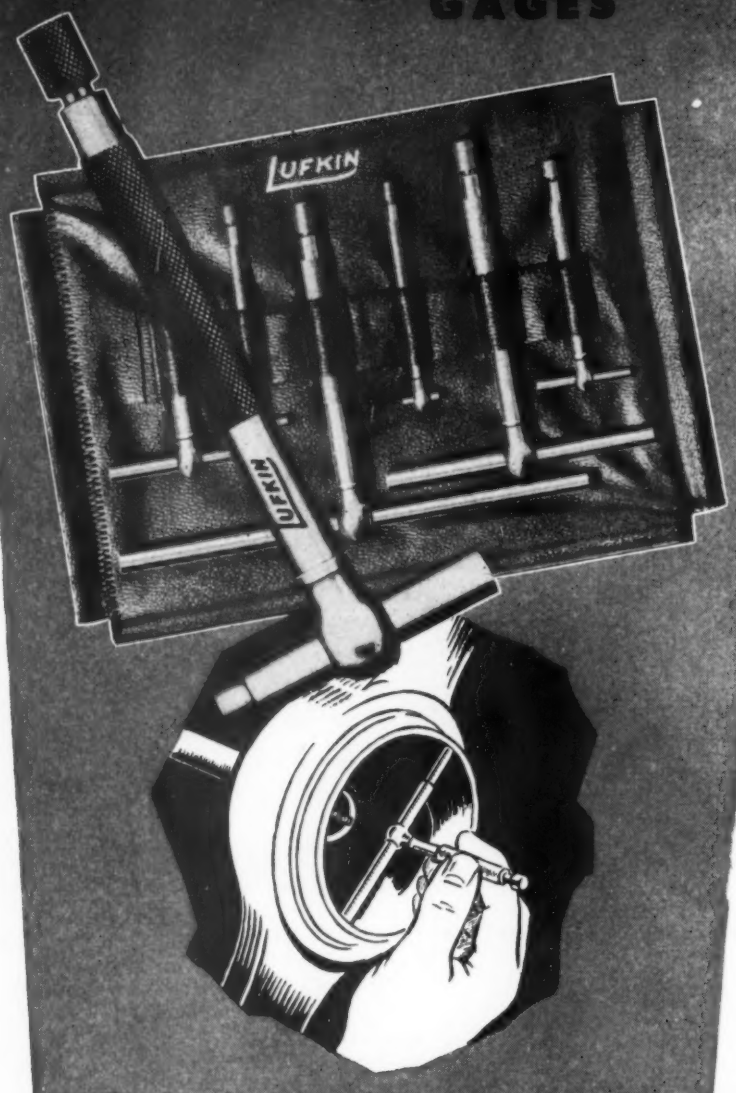

It's no trick at all to gage inside dimensions of finished holes, slots, and keyways when you use the Lufkin Telescoping Gage. The handle is easily centered on the plungers, which telescope under constant spring tension, to provide the delicate balance and feel so essential to accuracy. A twist of the handle locks the plungers in position for measurement with micrometer. Available in six sizes, with 5/16" to 6" range. Write for free catalog. THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.

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LUFKIN FOR ACCURACY

ROUND TABLE Discussion

SHOULD MACHINISTS BE LICENSED?

The question of licensing machinists raises interesting issues of a nature which justify serious consideration before dismissal without action. There can be no doubt that selection of machinists by the old methods of trial, acceptance or discharge, is costly and often vexatious. This is particularly true when jobs, urgently needed, are waiting to be done. Material as well as time can be wasted and any scheme which can avoid waste deserves a welcome.

Serving of an apprenticeship has been accepted as ensuring training requisite to provide the standard of skill required, but this just does not always work out in practice. The standard of training may be good; it is the gray matter of individuals which varies, and there are stars and duds in every walk of life.

The musical world can be taken as illustration. Many persons learn to play the violin and others learn to sing, but few are good enough for the concert platform. This is true of apprentices who by their accomplishments, or lack of them, automatically grade themselves as good, bad, or indifferent. Quite often they retain such ratings through life. These qualities, or faults, fundamentally are innate; they cannot be changed and ought to be recorded.

If an intelligent method of testing the intelligence, skill and knowledge — horse-sense — of machinists were devised and grades were issued accordingly, manufacturers and their foremen would be given real help. Furthermore, if the grade of skill for vacant jobs were made known, it would save manufacturers and machinists much trouble.

In Britain, and possibly in the United States, such a scheme would have an additional advantage. Owing to war requirements, many people with varying degrees of knowledge, ignorance and intelligence were drafted into the workshops. Some were good; some were not good. Some have made good and want to remain, some of these being women. Quite good work has been done and the feeling exists and the claim is made that they are competent machinists. No question is more difficult to discuss and settle than that of

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For Example:

THIS 4130 STEEL ROCKET TUBE, ROCKWELL 34-38C

Size: 4.220″ diameter x 20.5″ long.
Preceding Operation: Diamond Bore.
Average Stock Removed: .030″ on diameter.
Average Time: 5.45 minutes
Average: 1.5 cubic inch per minute.
Average: .0055″ on diameter per minute.

Another Example:

Aircraft Propeller Blade Tubing

Size: 8.000″ diameter x 96″ long.

Preceding Operation: Drawn Seamless Tubing with scale in bore.

Average Stock Removed: .050″ to .080″ on diameter (approximately 156 cubic inch in bore).

Average Time Required: 65 minutes.

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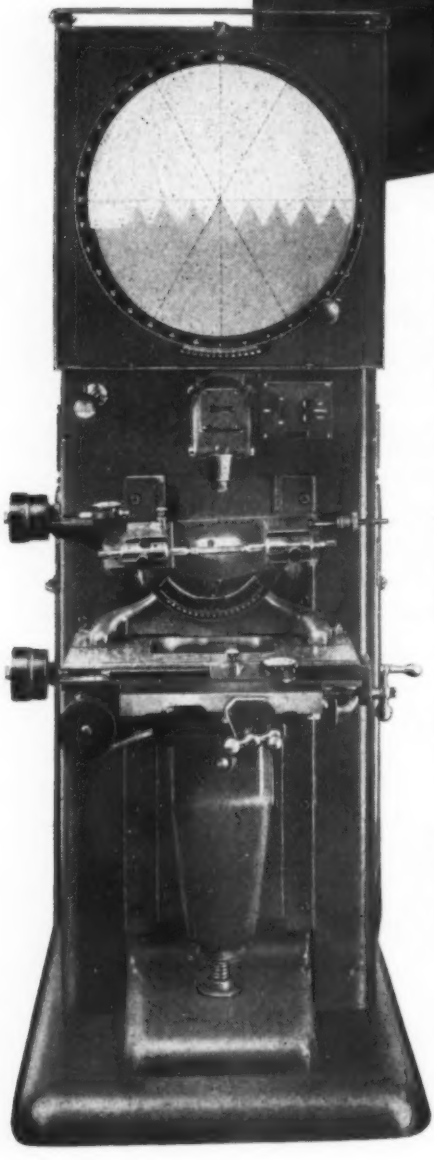

HOW do you measure, compare, and inspect machine parts? Have you checked your present methods with the advantages of the Bausch & Lomb Contour Measuring Projector?

This versatile, precise, optical instrument provides a modern method that is simple, economical, and fast. It projects a sharp, distinct, geometrically true, magnified silhouette of the object. Dimensions, angles, and profiles may be compared directly with a large scale drawing superimposed on a plain screen. By utilizing a protractor screen, all angular measurements can be made to ±1 minute of arc (1′)—an accuracy not available with any other projector. Also, direct measurements, accurate to ± .0001″, may be made by means of the cross slide stage with its attachments.

Many manufacturers are using the Bausch & Lomb Contour Measuring Projector to make more precise products in less time, at lower cost. Write for Catalog D-27. Bausch & Lomb Optical Co., 618-10 St. Paul St., Rochester 2, N.Y.

BAUSCH & LOMB

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personal capacity. The grading of capacity as discussed under this heading could go far to settle the question of equal pay for equal work. Graded pay for graded capacity would be a more clearly defined issue.

J. Ellward
Kent, England

•

FOREMAN—BOSS OR GANG LEADER?

Human nature is a strange thing. Most people like to be made to feel that they are "big shots." This is true in all races. The use of honey can help to get more work done in many cases, but there are always a few that require more drastic measures. A foreman should definitely be a leader. He must be able to observe and learn the traits of his employees. Some will need constant supervision, others will do their work without any guidance, still others will have to be kidded into working efficiently by appeasement of some whim or actual need.

Foremanship today is not an easy job if properly carried out. No set rules can be laid down and followed to the letter. Each man can follow a few basic principles but the rest is the human element. The foreman should outline the work to be done clearly to the worker. He should tell the worker exactly what is expected of him. The method employed in this explanation will naturally be dependent upon the human element involved. Sometimes . . . with certain people . . . kidding has the reverse effect—it can cause resentment and ill feeling.

So, again, each foreman must know his workmen, and administer the proper methods to accomplish the best results.

Charles Delmar Townsend,
Cleveland, O.

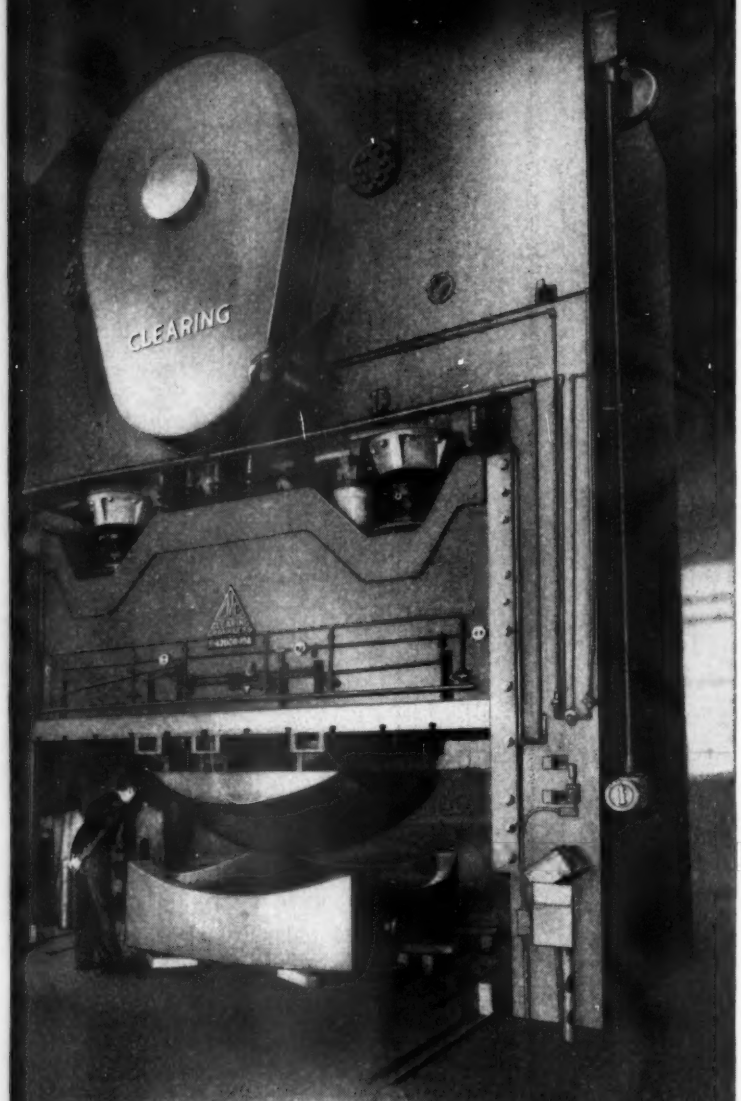
•

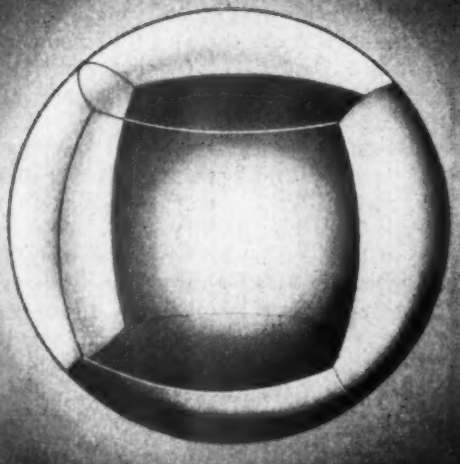
IS IT SAFE TO GIVE CREDIT WHERE IT'S DUE?

My answer to this question is that it would be just as safe to use the same kind of oil for every machine in a department, regardless of its structure or operational duties. Both Al and Ed are apparently correct in their assumptions, as a worker seems to perform his best when he is working for a consistent boss, whether he be consistently grouchy or consistently a softie.

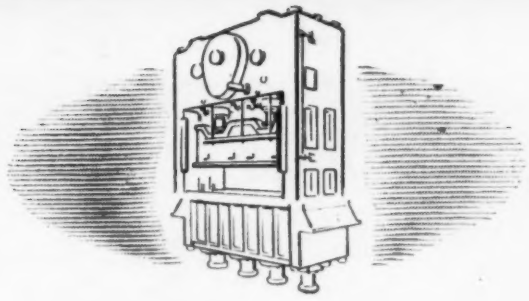
After all, a man's good work stands as a permanent record of his ability, and he actually needs no

This 2,000-ton Clearing mechanical press has a 30" stroke, and operates at either 1 or 3 strokes per minute. Bed area is 96" x 194"; shut height is 60". Four double 32" cushions with 15" stroke (below the floor level in the picture) give a total cushion capacity of 321 tons. Four 16" locking devices and pneumatic flywheel brake are also part of the equipment.





Segments are formed as shown in the photo, then flame beveled for welding into a complete sphere of 126" inside diameter. Each individual segment as it comes from the press weighs nearly a ton.



Cold Forming 3/4" Plates for 10'6" Spheres

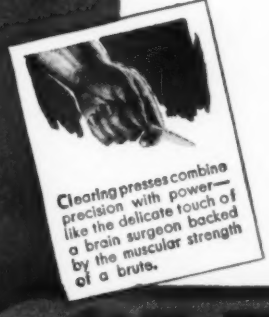
To hold propane and other gases under sufficient pressure to keep them as liquids for compact storage is a job calling for engineering—and manufacturing facilities—of the highest order. Spherical tanks have certain technical advantages, but their production involves an exacting forming operation on heavy plates—flange quality steel of 55,000 p.s.i. tensile strength, .75" minimum thickness, and 101 inches square.

The Commercial Shearing and Stamping Company, Youngstown, Ohio, are forming such plates on the Clearing press (2,000 tons capacity) shown in the illustration. The six finished segments to make a complete sphere are assembled with only 78 lineal feet of weld. The result saves more than 35% of the material needed for a cylindrical tank to provide equal capacity.

Clearing presses have long played an important part in the production of better items at lower costs, because Clearing makes engineering dreams come true. If you need a huge press of tremendous strength, Clearing can provide it. With small presses or large, if your work demands extreme precision, unusual flexibility of control, high operating speeds or special cycling—Clearing has the answers.

If you want to do something that has never been done on a press before, you will find kindred spirits, well fortified with experience, at Clearing.

It will pay you to consult Clearing on your prospective production problems. There is no cost or obligation involved in doing so.



Clearing presses combine precision with power—like the delicate touch of a brain surgeon backed by the muscular strength of a brute.

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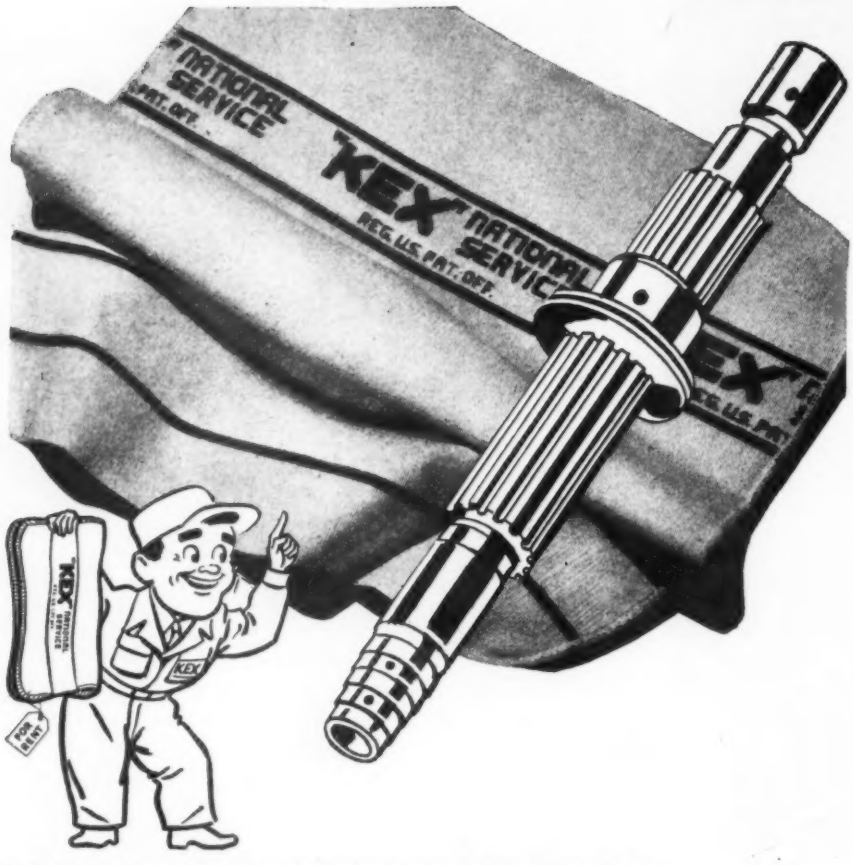

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KEX Wiping Cloths are soft and safe. They have no abrasive dirt—no buttons, hard seams, etc.—to dig into delicate finishes. And every square inch of a KEX Wiping Cloth is *wiping* surface—hundreds of more wipes per pound over ordinary waste or rags.

KEX Wiping Cloths are uniform in size—distribution is easier to control. And fresh KEX Wiping Cloths—chemically cleansed by a *special* high-heat process—are delivered as often as needed. You always have plenty of clean KEX Wiping Cloths on hand.

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Try the KEX Wiping Cloth system, today! There's nothing to buy, no expensive inventory—just a low monthly rental. And the very first month should show a considerable saving on wiping costs. For complete information, phone your local KEX representative—
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praise. It is a fact that we respond to praise, but it must be sincere and coming from someone whom we know is consistently sincere. Persons are usually courteous, considerate, and patronizing at odd and various times—consequently, a foreman, who after all is a person, should not be expected to spring forward with just the right attitude and words when the occasion requires to boost an ebbing morale.

Morale-building praise is easily detected by the worker as being a low grade of industrial "oil," applied indiscriminately to produce better production. It sounds cheap to the worker, and lessens his respect.

The foreman must study his men, because no short cuts or cure-all methods of morale building are to be found. This morale building takes many months and years, and may be destroyed in moments.

Be sincere with your men, protect their interest and confidences over a long period, and when the time comes that you feel you will bust if you don't tell a Bill Jackson that he is pleasing you with his work, then it is safe to "give credit where it's due."

T. W. Lawson
Engineer
Watseka, Ill.

•

EQUAL PAY FOR EUQAL WORK?

Ed's Henry Mack is a type that will be found in many shops. They are often exceptionally smart workmen and keenly aware of it. They often prove difficult for fellow workers to get along with and rarely are they understood, even by their bosses.

The Henry Mack type would never become a real leader, no matter what his ability as a toolmaker or machinist might be, because he doesn't know the value of cooperation. Generally he looks down on less-skilled workers and seldom offers a helping hand.

It takes all types of men to make up shop personnel. A man like Henry Mack can be assigned a skilled job, instructed in what is to be done, and then let alone. He would be content doing special work, even though he receives the same rate of pay as others. It would please his hidden vanity. It would not pay, however, to grant him special favor for his ability, because it would lead to dissatisfaction on the part of other workers.

All men in a given group are certainly not worth the same wage. Those who stand out in ability, loyalty and conscientiousness should

FOR BETTER FITTING AND Decreased Wear

BARNESDRIL No. 5E *External* Horizontal Honing Machine. Work is rotated and reciprocated while tool is held in a fixed position. Also shown is the BARNESDRIL Magnetic-Automatic Coolant Separator which removes the metallic particles from the coolant, assuring superior finish work.

BARNESDRIL No. 5L *External* Straight Line Honing Machine of two-spindle construction. Work is held and rotated while tool is reciprocated.

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The Honing process not only generates finished surfaces in cylinder bores . . . but on EXTERNAL SURFACES of piston rods, shafting and tubing, the *external honing* process results in reduction to a minimum in wear on packing and provides a more perfect fitting to attain a higher peak of efficiency in products. In hydraulic assemblies, a better oil seal is provided through external honing.

External Honing . . . a precision production process . . . assures a high degree of accurate roundness and smoothness as well as straightness throughout the full length of the workpiece. Starting at the rough machined surface, honing cuts down to base metal quickly; then delicately completes final finish to a lustrous metal surface and establishes the required size precisely.

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Proper honing gives any desired surface finish. Tool marks, hills and valleys and grinder marks (from previous machining operations) are eliminated through honing . . . resulting in a uniform, superior surface.

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BARNESDRIL engineers can show you how to apply the honing process to your particular jobs for both internal and external surfaces. There is no obligation for this service.

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Representing a new development, WELDON Stub Arbors are specially designed to be used in place of the longer, unwieldy, conventional type of milling machine arbors. They can be handled with greater ease and convenience. At the same time the initial cost is less.

They are firmly held by the successful double screw drive and are especially adaptable to tool room and light manufacturing operations. Sold in sets or singly.

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with Sizes and Prices

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be rewarded with higher wages. Some firms give these men an extra week's vacation with pay and consider them when promotions arise. These cannot be considered in the form of favors. They are actually recognition of honest endeavor.

Such recognition is a potent factor in keeping workers on their toes and in fostering individual initiative. If employees are treated as groups, individual effort will vanish.

Arthur Silvester
Philadelphia, Pa

•

"Equal pay for equal work" is another catch phrase with dangerous implications. Who, for instance, ever saw two people who were exactly alike or who did a job in exactly the same way? Then how can they do equal work?

It is this attempt to place people in categories—regimentation—that is playing havoc with our economy, an economy founded on the recognition of individual differences. That is why our founding fathers said, "America is to be a fine theater for the display of merit of every kind, and if virtue is ever to be rewarded, it is in America."

Let us go back a few years to the time when an enterpriser, employing a new man at a given rate of pay, later raised his pay when his work helped the enterpriser make more money. The new man displayed his merit and was rewarded. However, somewhere during the last depression, the boss seemed to get out of the habit of raising salary checks, and so merit and reward got out of step. As a result, how often did we hear the old story of "Around here you've got to quit to get a raise."

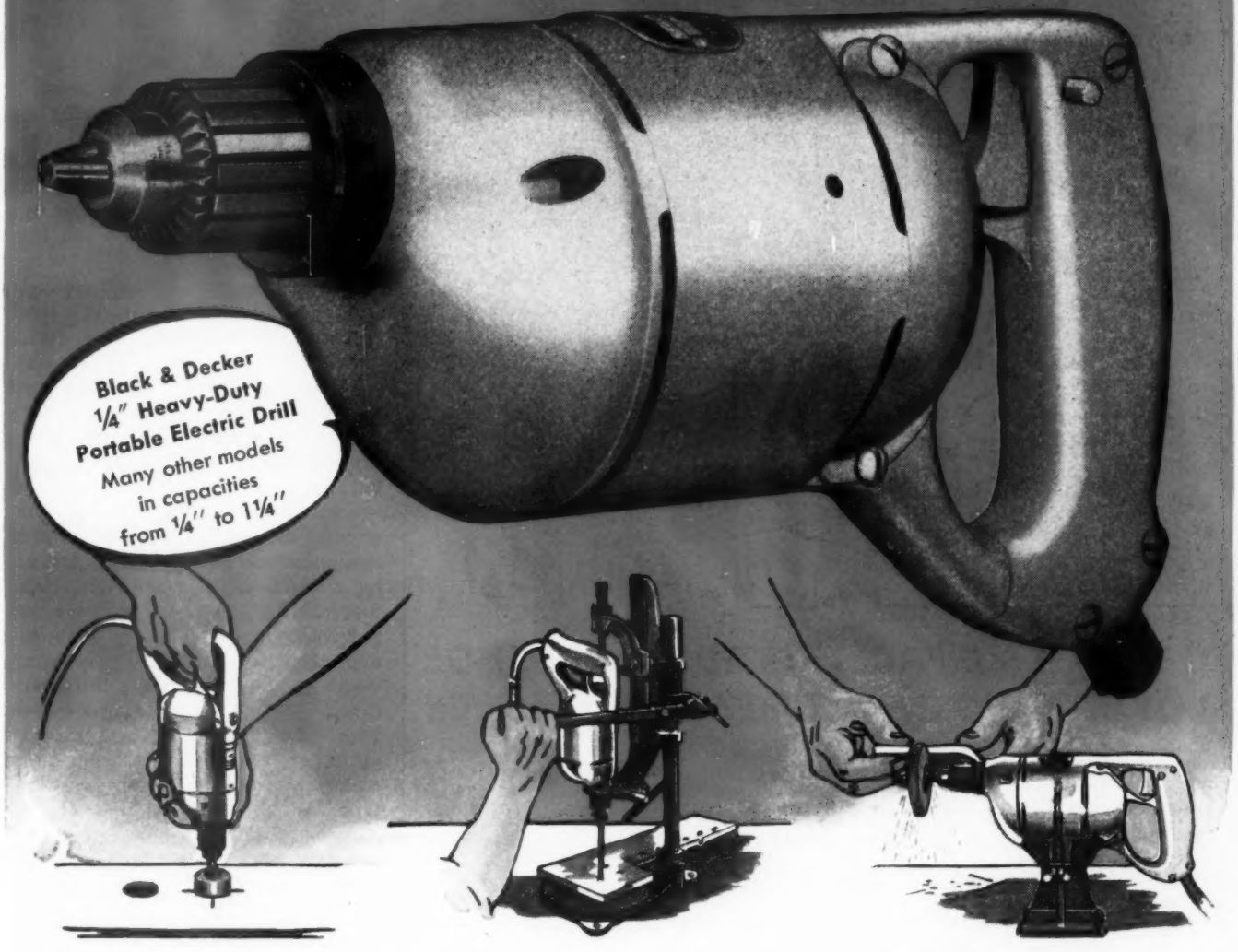
To cope with this feeling, the boss gave a general raise which in effect rewarded the loafer and neglected the good worker. The result was that the worker said, "What's the use?" and slumped toward the status of the loafer. Instead of achieving the desired results, this pay raise decreased efficiency.

The next move the boss made was to install piece rates, and with it quantity was substituted for quality. Again the good worker moaned, "What's the use!" and slumped some more.

Then the boss found himself in hot water with the union because of inequalities in wage rates that couldn't be justified. He turned to job evaluation which, besides protecting him, was good reasoning, as far as it went. It meant that if two men started in different sections

Saves Time, Cuts Costs on Wide Variety of Jobs!

You Have Many Uses for This Versatile Drill



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The 1/4" Heavy-Duty Drill drives twist drills up to 1/4", wood augers up to 1/2", Hole Saws for cutting clean, round holes up to 1 1/2" in diameter, in any material a hacksaw will cut. It's powered and built for continuous production.

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Mounted in a Black & Decker Bench Drill Stand, this Drill makes a powerful drill press. Plenty of leverage to put on the pressure where needed. A slow, smooth feed for more precise work. Same tool does both bench and portable work.

As a Multi-Use Tool . . .

Mounted in a Black & Decker Horizontal Drill Stand, the 1/4" Heavy-Duty Drill does stationary drilling and reaming. Drives wheels for light grinding, wire brushing and buffing. Ball bearings on all spindles make it ideal for this latter work.

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FOR FLAT SURFACE - STRADDLE MILLING - SLOT CUTTING ON ALL METALS & PLASTICS

The New-Field fly cutters provide an economical and efficient means of putting your idle standard tool bits to work. Designed for high speed or carbide tool bits, the New-Field Fly Cutters provide you with a wide range of special shaped milling cutters.

NO COSTLY PRODUCTION LAGS due to broken or dulled cutters . . . simply remove the defective bit and continue operation. The New-Field Meehanite cutter bodies, developed specifically for efficient FLY-WHEEL ACTION, absorb vibration, prevent tool chatter, reduce power requirements and increase cutter life.

MORE CHIP REMOVAL per horsepower with New-Field Fly Cutters. Regular models; 4" to 10" diameters—⅝" to 1" widths. Extra Heavy 6" and 8" diameters—1-3/8" width.

Write for descriptive bulletin.

of the plant, both with equally dirty or equally skilled jobs, they would get the same wage rate—which was only fair. But again the good worker was forgotten, because despite all his know-how and his accumulated service, he was getting the same or only slightly higher wages than the new men. His only chance for increased wages was through a union-procured raise.

Today the good worker has a different attitude. His old philosophy of "You get out of life what you put into it" has been replaced by yearning for "something for nothing."

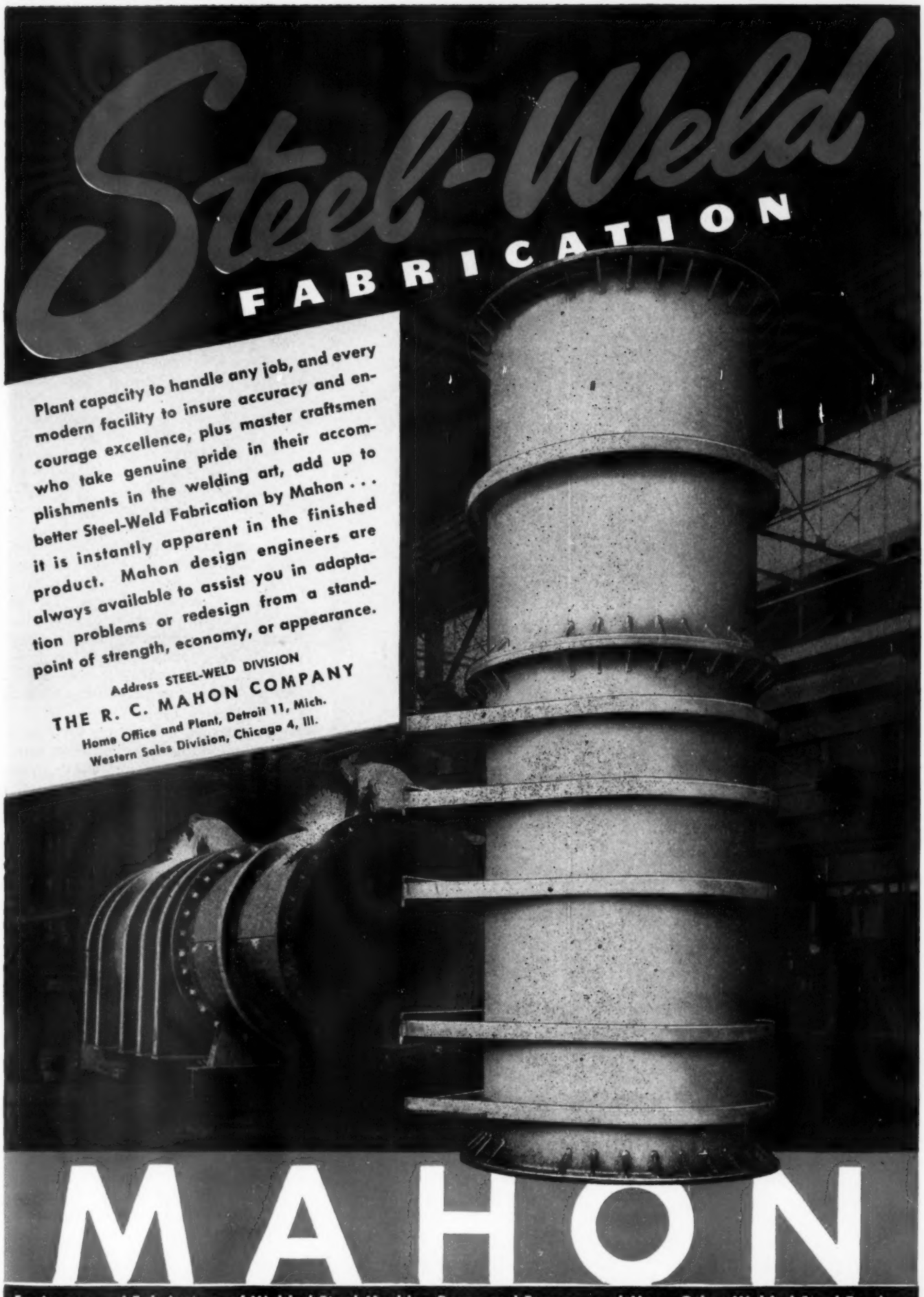
Some people are getting back to the old system of recognizing individual differences and are once more applying the ideas of "man evaluation" and "merit rating." This will mean a wage competition, but who minds giving raises when they are earned?

Here's how this "wage competition" can be worked out: (1) Evaluate the job first of all. The job is one variable which can be standardized relatively easily and the wage rate decided on would be the starting rate for the job; (2) Set up a "raise fund" in each department to be administered by the foreman. He knows his employees better than anyone else and should be able to recognize merit where it is due. If he doesn't, he has no right being foreman. If he has properly expended company funds on materials and labor utilization, he certainly won't go hog-wild with the "raise fund;" (3) set up a rating sheet on which the foreman can rate his men either on a monthly basis or more frequently. This rate sheet should take into consideration the employees production, the quality of his work, his absenteeism, his cooperation, his safety habits, the care he takes of his equipment, his initiative, and his length of service. With a rating based on these points, the foreman should be able to determine which of his men are in line for a raise; (4) these raises, symbols of merit rewarded, would build up in increments on top of the starting rate. In this manner, there would be justified "inequities," adjusted to the different workers and their ratings.

Following this plan, it would be far better to think in terms of "unequal pay for unequal work" and wage competition, thereby accepting the fact that individuals do differ and must therefore be dealt with individually in determining their compensation.

R. N. Marshall
Yardley, Pa.

Steel-Weld FABRICATION



Plant capacity to handle any job, and every modern facility to insure accuracy and encourage excellence, plus master craftsmen who take genuine pride in their accomplishments in the welding art, add up to better Steel-Weld Fabrication by Mahon . . . it is instantly apparent in the finished product. Mahon design engineers are always available to assist you in adaptation problems or redesign from a standpoint of strength, economy, or appearance.

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"Quotes"

Profit-Making Tips

A CONSTANT and unceasing search to improve operations and solve individual production problems is held imperative to successful management. John D. Corrigan of Corrigan, Osburne & Wells, Inc., has this to say about techniques designed for improving operations:

"The starting point in a company, where there is a desire to modernize techniques, is a business analysis to develop a plan of action. Realizing that it costs money to move one pound one foot, and it is a waste of money if the move is unnecessary, the first step is development of a process layout with the necessary changes as needed.

"The problem of wages is handled by the technique of job evaluation, merit rating and wage incentives. Job evaluation eliminates horse-trading in a union negotiation meeting and puts the problem of a fair day's pay on a sound, scientific, factual basis. Merit rating measures the quality of a company's personnel and is the basis upon which able, loyal and thinking employees are developed, retained and made more effective.

"Many plants can lower their costs by eliminating labor-waiting time, idle machine time and bottlenecks. The technique to use is a modern production control system which includes the time factor and visual aids to indicate off-schedule performance at a glance.

"The most effective technique found to control overhead cost is to place the responsibility for these costs at the point where they originate and to set up a control to assure the company of holding such costs at a minimum. This technique of decentralized authority and responsibility, and centralized controls will increase the effectiveness of executives, supervisors and foremen by organizing, stimulating and controlling their activities. A supervisory incentive based on improving the cost factors over which they have control is worth consideration. The flexible control budget sets the cost standard in relation to production. The incentive is based on a share of the savings by operating at less than standard. Thus the executive and company benefit from any cost reductions.

"Modern management techniques

NATIONAL
TWIST DRILLS

A Particular Type of Drill For Each Material

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Leading distributors in every section of the country have stocks of National Cutting Tools. Every National distributor offers factory-trained engineers to serve you. Call your National distributor for cutting tools or any staple industrial product.

Select the *right* drill for the job at hand. NATIONAL offers deep hole drills, center drills, starting drills, and combined drills and countersinks—to name but a few—each specifically designed for a particular purpose. There are NATIONAL drills for working wood and plastics, as well as all kinds of metals and alloys.

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NATIONAL

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Supply your air driven tools and cylinders with a smooth, steady stream of power free from surges and pressure drops. Get snappier air tool and cylinder operation. More production. Less maintenance.

Efficiency and long life of Norgren Regulators is due to floating diaphragm and syphon tube. **FLOATING DIAPHRAGM:** a resilient member of great strength, assures flexibility, quick action and long life. **SYPHON TUBE:** action of the air as it passes over this tube opens valve wider, permitting a *larger volume* of air to pass with *less pressure drop* than conventional regulators.

Get the facts today. Learn how simple design and precision construction of Norgren Regulators step up performance and cut pneumatic power costs.

Write for catalog No. 400. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado.

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are essential in every organization. The methods and procedure shown here are the major requirements. Other techniques need to be developed to meet the particular individual requirements of a company. The results can be measured in low-cost production and higher profits. Improving operations, thereby increasing labor productivity, is a profit-making activity."

INDUSTRIAL FILMS

The Miller That Uses Its Head. W. H. Nichols & Sons has announced this 16-mm. color sound movie which runs for 23 min. The film is an analysis of the Nichols hand miller from the tool engineer's and tool designer's viewpoint. Inquiries for showings should be addressed to Nichols-Morris Corp., 50 Church St., New York, N. Y.

This Is Frontier 40-E has been produced by McLarty Films, Buffalo, N. Y., for The Frontier Bronze Corp., Niagara Falls, N. Y. A 16-mm., half-hour sound picture devoted to the foundry technique, laboratory methods and applications of Frontier's new high-strength aluminum alloy.

Metal Magic describes various uses of induction heating, properly applied. This 16-mm. sound, color movie, which takes 12 min. to run, can be obtained from Allis-Chalmers Mfg. Co., Advertising Dept., Milwaukee, Wis.

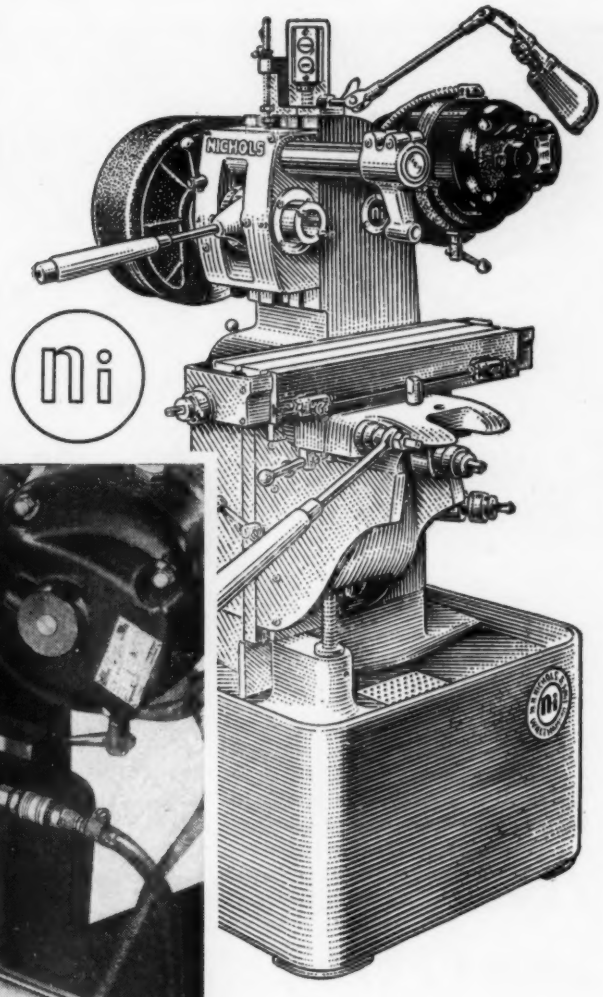
The Formica Story depicts the history, making and postwar application of laminated plastics. The Formica Insulation Co., Cincinnati, Ohio, prepared this 45-min. color motion picture.

Unusual manufacturing operations with specially designed machinery showing many interesting close-ups are featured in a movie produced by Clark Equipment Co., Buchanan, Mich., especially adaptable for use in engineering schools.

Distributing America's Goods, a 16-mm., one-reel sound film released by the Twentieth Century Fund and Encyclopedia Britannica Films, portrays the change in America's economic system from handicraft production to mass-production methods. The film is available for purchase from Encyclopedia Britannica Films, Chicago, Ill., or for rental from various film libraries.

Our Industrial Air Power shows the industrial uses of compressed air. A 25-min., 16-mm. sound color film, it

More power to you
More speed to you
More profit to you



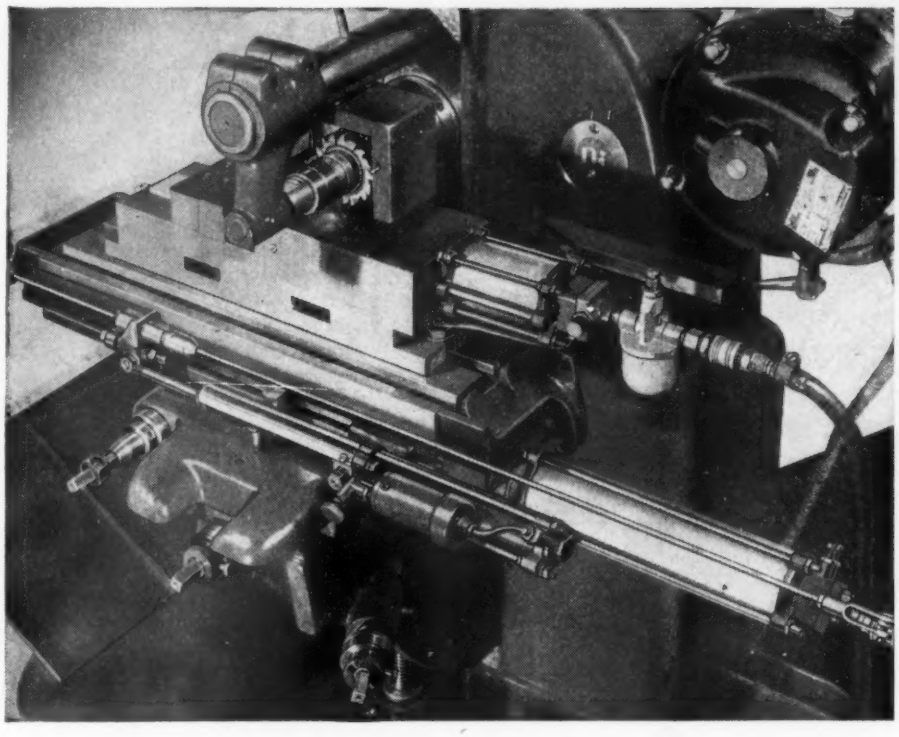


Photo shows Nichols power feed attachment installed. In this case, work is held in an air-operated vise

...with the *New Nichols* Power Feed Attachment

● Here is a tested and proved power feed attachment that is an added production asset for *any* Nichols Miller. It is designed to reduce the time of the operating cycle and reduce the operator's duties so that often one operator can run two or more machines.

This power feed attachment is designed for fast table advance — maximum proper cutting feed — fast table return — automatic shut-off. It is completely automatic except for loading and unloading the work. Rapid traverse and work speeds are easily and quickly changed to suit all classes of jobs within the capacity of the machine.

Basically this attachment is a Bellows air feed unit used in conjunction with a Hydro-Check. Thus a positive, infinitely variable feed is obtained throughout the 9" maximum cutting stroke by using regular shop air lines with 75 to 175 lbs. pressure.

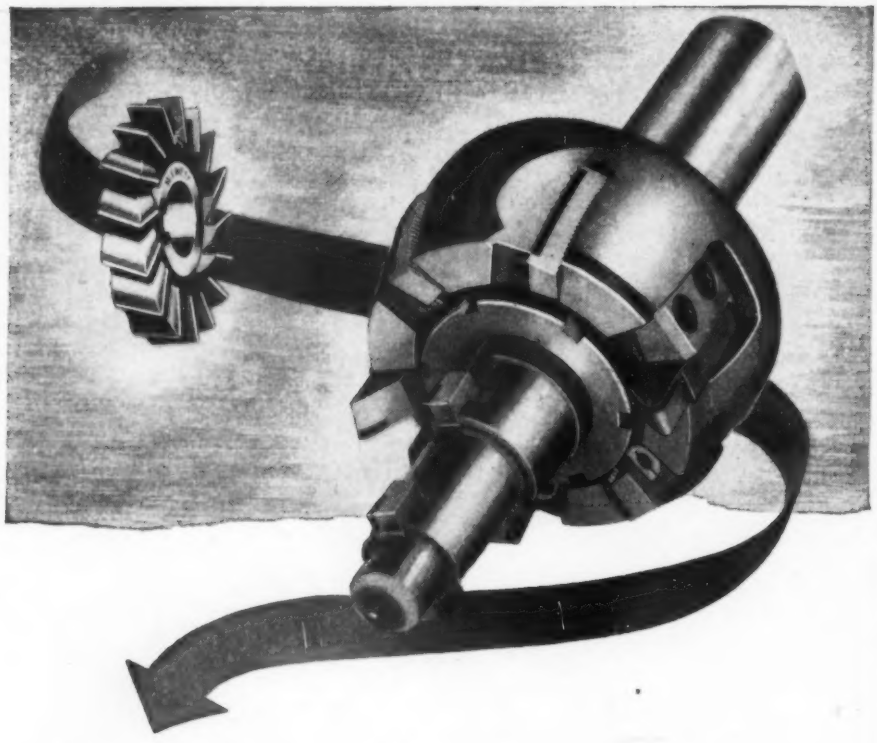
The Nichols power feed attachment can be installed either before or after shipment of the Nichols Miller. *It can be installed quickly on any Nichols Miller ever built.* Write for details.

Send for free Nichols Miller Catalog

THE *Nichols* MILLER

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 40 CHURCH ST., NEW YORK 7, N. Y.



Now-here is what we're trying to put across--something that may be helpful to you...

The two samples shown above are metal cutting tools—one a simple standard milling cutter, the other a very special cutter that does six operations at one time. Midwest designed them, engineered them, produced them. They're shown to give you a quick idea of the extensive range of Midwest tools. They lead us to the message we want to put across.

To begin with, and as you suspected, the message comes from the Midwest Tool & Mfg. Co., location W. Jefferson at Travis, Detroit 16, Mich., when you want to write and find out just what help we can be when it comes to metal cutting tools.

We want you to write us about tooling problems you may have, little or big. They always involve production rates, costs, operations and all the other tooling factors, particularly on special set-ups, which make the difference between profit and loss in manufacturing. We've been in this metal cutting tool business over 35 years. The 35 years provide quite a bit of experience to draw upon. They give us something to offer you—something to help solve your metal cutting problems. Why not consult us now?

By the way — ask for this general metal cutting tool Bulletin 1041—one of several interesting bulletins published by Midwest.

is available for showing before students, engineering societies and other groups without charge from the Quincy Compressor Co., Quincy, Ill.

A Thunderbolt Is Made depicts the complete manufacturing process of a P-47 in a 30-min. 16-mm. sound film, which was produced and is distributed by the Republic Aviation Corp., Farmingdale, N. Y.

It's Your Money shows modern material-handling methods and resultant economies. This film, sponsored by the Philadelphia Div., Yale & Towne Mfg. Co., is a 16-mm. sound picture which runs for 35 min. with a Lowell Thomas commentary. It is available from Hathen Productions, 264 S. Van Pelt St., Philadephia 3, Pa.

Speed In Cutting pictures the uses of abrasive cutting-off machines. Produced for A. P. DeSanno Co., this 20-min., 16-mm. sound film is being distributed by Hathen Productions, 264 S. Van Pelt St., Philadelphia 3, Pa.

Only A Gasket is the story of the "biggest little thing in industry." The engineering research and manufacturing techniques employed in the industry are recorded in this 35-min., sound, color, 16-mm. film with Lowell Thomas as commentator. Produced for the Goetze Gasket & Packing Co. of New Brunswick, N. J., it is being distributed by Hathen Productions, 264 Van Pelt St., Philadelphia 3, Pa.

Robots At Work describes the automatic molding of thermosetting plastics. A 35-min. sound, color, 16-mm. film with a Lowell Thomas commentary, it was produced for the F. J. Stokes Machine Co., Philadelphia, and is being distributed by Hathen Productions, 264 S. Van Pelt St., Philadelphia 3, Pa.

The importance of solid carbide blades, mechanically held, in precision built toolholding bodies is set forth in a series of five Visual Sound productions released in conjunction with Kennametal, Inc., Latrobe, Pa., and Pilot Productions, Chicago, Ill. The productions are sound slidefilms, single-frame, 35-mm., accompanied by electrical transcriptions and distributed by Kennametal, Inc.

Tools For Profit describes the economic advantages of the new "process" machine tools in action, performing a series of metal cutting operations simultaneously or progressively at the push of a button, over conventional "operational" machine tools. This 30-min., 16-mm. sound film was produced by Hathen Productions for the Cross Machine Co., Detroit, Mich., and is available from Hathen at 264 S. Van Pelt St., Philadelphia 3, Pa.

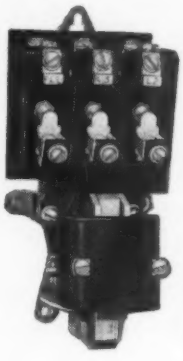
PLENTY OF ENGINEERING "KNOW-HOW"

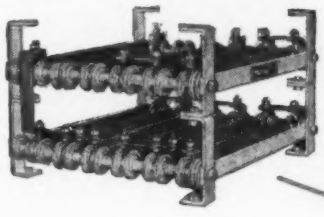
but not a single special device—

ON THIS "3C" MACHINE TOOL ELECTRICAL CONTROL PANEL

"3C" engineers built this heavy duty control panel for a Vertical Boring and Turning Mill entirely of standard Clark apparatus. It is designed to provide accurate control and overload protection for the motors which operate the machine.

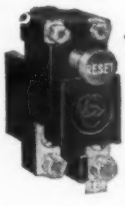
Hundreds of machine tool control panels built of standard, time-tested and proved "3C" devices are serving in many varied industrial applications. "3C" engineers have the "know-how", and are at your service to solve similar problems.



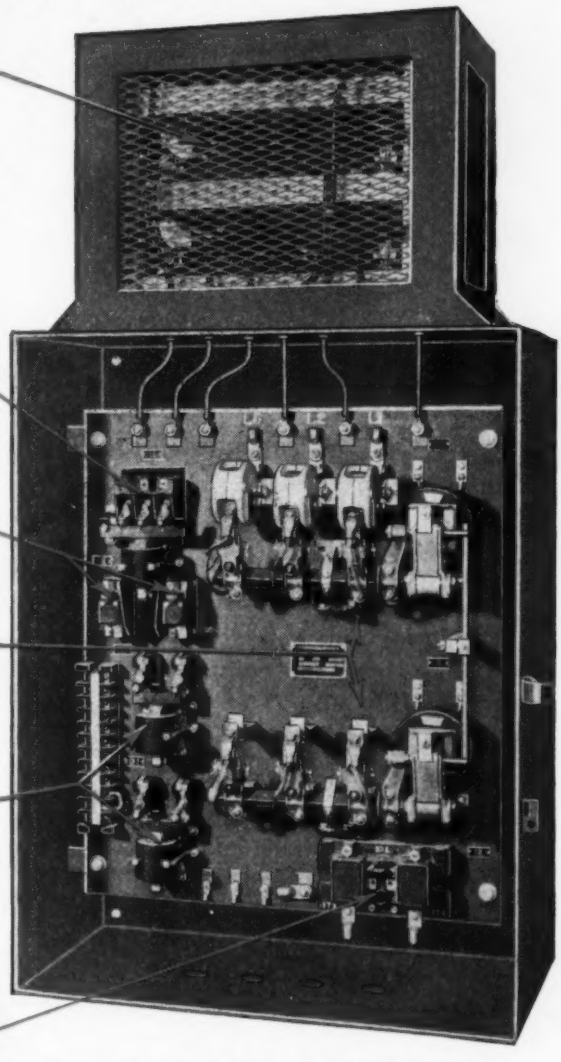


BULLETIN 110 RESISTOR. Edgewound type—non-breakable construction. Ventilated enclosure dissipates heat generated by resistors and keeps down ambient temperature inside the cabinet.

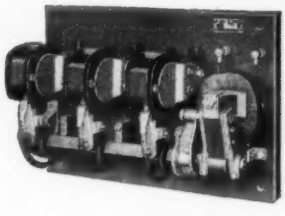
BULLETIN 7707, TYPE DS, MAGNETIC CONTACTORS—for control of traverse motor. All terminals accessible from front. Contactor assembly mounted on cadmium plated steel plate.

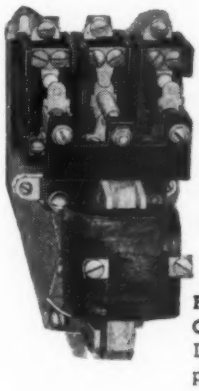


BULLETIN 7323 THERMAL OVERLOAD RELAYS. Two of these relays provide complete thermal overload protection for the traverse motor. Double-break silver-to-silver contacts have high contact pressure



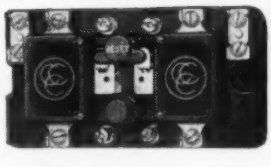
BULLETIN 7700 MAGNETIC CONTACTORS. Two three-pole mill-type contactors control operation of main motor. Patented hinged armature magnets provide adjustment to eliminate hum.





BULLETIN 7305 MAGNETIC CONTROL RELAYS—Heavy duty type, for circuit control. All contacts are visible and easily removable.

BULLETIN 7322 THERMAL OVERLOAD RELAYS—Duplex mill duty type, for providing thermal overload protection on main motor.



"3C" Control for Vertical Boring and Turning Mill, built from standard "3C" Electrical control devices.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

OUT OUR WAY

I'VE TAKEN ENOUGH FALLS IN THAT GREASE! HOW 'BOUT PUTTING SOL-SPEEDI-DRI ON TH' FLOORS? IT'LL SAVE SOMEBODY'S NECK!
HA-HA! THAT'S GOOD! TH' OLD BULL OF TH' WOODS THOUGHT HE WAS GOIN' TO HIT HIM UP FER A RAISE! HE ALLUS STOPS BY SOME NOISY MACHINE OR MOTOR SO THEY CAN'T BE HEARD-- BUT THAT GUY IS CLEVER--HE WANTS SOL-SPEEDI-DRI!
TOO CLEVER-- HE FORGOT THAT IT'LL TAKE THE BULL TWO YEARS TO SEE THE FUNNY SIDE OF THAT!
J.R.WILLIAMS
THE SMART TALKER
T. M. REG. U. S. PAT. OFF. COPR. 1946 BY NEA SERVICE, INC.

IT'S SMART TO USE SOL-SPEEDI-DRI

Yes, it's smart in more ways than one to use SOL-SPEEDI-DRI. This white, granular absorbent takes the slips and falls out of dangerous, oil-slick floors . . . makes them safe for walking, safe for working! SOL-SPEEDI-DRI steps up production by keeping men on the job . . . by releasing cleaning personnel for more productive work. Only one man is required to apply SOL-SPEEDI-DRI. No complicated expensive machinery is necessary. Just spread it around . . . and floors become safe!

SOL-SPEEDI-DRI soaks up soluble oils, resins, syrups, solvents, acids, and regular oils and greases as a blotter soaks up ink. In time, it will clean up even ancient deposits. SOL-SPEEDI-DRI also reduces the danger of fast-spreading flash-fires, because it will not readily burn even when oil-soaked.

SUPPLIERS:—*East:* Safety and Maintenance Co., Inc., New York 1, N. Y.
South, Midwest, and West: Waverly Petroleum Products Co., Philadelphia 6, Pa.

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OIL AND GREASE ABSORBENT
UL
FREE SAMPLE
Get the full story of SOL-SPEEDI-DRI today. Just write "SOL-SPEEDI-DRI" across your letterhead or business card and mail.

TO THE EDITOR

SECONDARY RESISTANCE

Your editorial "Secondary Resistance" interested me very much. Unless manufacturers adhere to higher ethical standards in their relationship with their employees, I do not think we can hope to get anywhere in breaking down this so-called "secondary resistance."

A new machine operator who excels at his work in a short time loses heart when he flinds his rate cut. Morever, he might contribute to cutting the wage rates of fellow workers. The machine age is often blamed for what actually is caused by management's unfairness and desire to take advantage of workers. Such attitudes have made unions necessary, despite their evils, and permitted the "New Deal" to make its inroads.

If a manufacturer is not trying to "get all the pie," and is willing to pay a fair wage for work done, the modern machine tool will bring rich rewards to everyone.

Industrialists and employees should read Dr. Daniel W. Mead's "Standards of Professional Relations and Conduct, Pamphlet 21," available at the American Society of Civil Engineers, 33 W. 39 St., New York 18. N. Y. If employers and employees lived up to the high standards proposed by Dr. Mead, it would do more than anything else to break down "secondary resistance."

Sincerely yours
John M. Wood
Albany, Wis.
(Member of A.S.M.E. and S,A,E.)

•

Cave Man Taper Turning

A RECENT ARTICLE about Brown & Sharpe and Morse tapers points out the inaccuracies of the two series. I always wondered how it was possible for even a cave man to turn out work that is so far from being correct.

Both series were originated after fairly accurate scales were in use. I personally own a D.B.&S. scale which is plenty old, probably being made before they originated the B. & S. taper. It is graduated in sixty-fourths and is accurate within a few thousandths per inch. With that scale and three pieces of bar iron suitable for straightedges and any lathe of any vintage, it is possible for a mediocre or even a poor tool-

INSIST ON *haskins* DURABILITY

In the flexible shaft line durability counts—and Haskins Flexible Shaft Machines *are* durable.

These portable tools will stand continuous hour after hour use—three shifts a day—seven days a week. They'll turn out more work—better work—faster and easier, with longer trouble-free operation. For grinding, sanding, rotary filing, wire brushing, buffing or polishing—use Haskins machines—use them hard. They won't let you down! Send for details.

HS-7
1 H.P. Multi-speed countershaft unit. 975 to 3100 RPM. Three wheel heavy duty truck. 360° motor swivel.

R. G. HASKINS COMPANY
2760 W. FLOURNOY ST. • CHICAGO 12, ILLINOIS

HASKINS

haskins
FLEXIBLE SHAFT EQUIPMENT

maker to generate a set of tapers within 0.005 per ft. of what is wanted. The principles involved date back to Euclid.

Most readers of this magazine are, I think, familiar with the generation of straightedges and their application to the generation of tapers by means of two disks of different diameters and their distance apart. Successive setups or duplications of tapers can be made by different people at different times within the limits I mention. But a still more curious point to be considered is that there is any variation in them at all. Assume that because of a lack of measuring means, the workman missed getting the first size correct in taper. That does not excuse him from being able to duplicate the rate of taper in any other diameter because all he need do is set two straightedges to the first generated taper, then use that as a gage for any other sizes or diameters. A crack of less than 0.001 in. is readily apparent between a straightedge and a cone, the succeding sizes agree with the first size within 0.001 or 0.002 in. at the most. To my mind, the duplication of a taper with an error of 1/32 in. per ft. in the one case and 3/32 per ft. in the other case represents very poor workmanship.

To summarize:

1. With the tools of their day, it was possible then and is possible now to originate a taper within 0.005 per ft. of requirements.

2. Once a model or initial size is made, it is possible now and was possible then with the tools they then had to duplicate a taper in various sizes or diameters within 0.002 per ft., if the series of sizes or diameters is comparable in range to the B. & S. or Morse series.

Having worked in shops for 35 years in successive capacities as apprentice, machinist, toolmaker, tool designer, machine designer, and chief and assistant chief engineers, I have naturally wondered about these discrepencies and have come to the conclusion that they must be due to one or all of the following reasons:

(a)—Each size was made on a Monday and the workman was still drunk from THE LOST WEEKEND.

(b)—The workman was a war worker from the previous war; (a) may or may not have been an influence also.

(c)—He was either, neither, or both (a) and (b) but he was an individualist.

(d)—He was ordered to make them different or bastard so the customers could not duplicate them and would have to pay through the nose for replacements.

Having sat in some round-table discussions with business executives and knowing how their minds work, I know they can see an immediate short-range profit based on anything including sharp practice, but cannot visualize long-range profits based on customer good will, and cannot understand the intangibles of business even if pointed out to them. My choice is (d).

Incidentally, is the practical way to produce tapers to use gages, or is it not just as practical to originate them to measurements with our modern means of doing so? For my part, I will take "Jo" blocks, precision straightedges and precision disks any day, and you can keep your gages with their possible wear.

—GEORGE E. HIEBER
Waynesboro, Pa.

Technical Dictionary

ENGLISH-FRENCH AND FRENCH-ENGLISH TECHNICAL DICTIONARY—*By Francis Cusset. 591 pages, 5 x 6½ in. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Price $5.*

Compiled to help the technical man in reading French technical texts and papers, this handy dictionary covers terms used in metallurgy, mining, electricity, chemistry, mechanics and science. Just completed, it contains terms which will be found useful both by men reading French papers and those reading English papers on recent technological developments. Type size is large and readable.

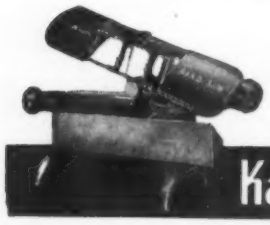
Truck Color Fashions

Color as advertising trade marks has an influence on the truck manufacturing industry. Records show that sectional preferences differ. The North and East favor dark colors while the South and Far West prefer the brighter hues. Truck manufacturers at the moment are eliminating optional colors in favor of appealing standard colors to keep trucks moving swiftly to regional markets. After the crush of production orders has passed, manufacturers will return to color variations running into the thousands.

Metal Band Saw blades run into money, especially when a saw is in continuous operation. Kalamazoo engineers designed this machine to use the minimum length of blade needed to do efficient cutting. The reversible saw tooth cleaner and coolant attachment are also factors in increased blade life.

Comparative tests show that over a period of years there is a saving of 10 to 25 per cent on blade costs in the operation of Kalamazoo machines.

Ask your dealer or write direct for complete information.



MACHINE TOOL DIVISION
Kalamazoo Tank & Silo Co., Kalamazoo 16, Michigan
IN CANADA—BRIDGE MACHINERY CO., MONTREAL

Kalamazoo *Metal Cutting* Band Saw

MEET YOUR LONG DRILL REQUIREMENTS WITH ACE DRILL'S 12" LONGBOY

The popular Longboy is an economical substitute for "specials" generally required for deep hole drilling. Like all Ace Drills the 12-inch Longboy is ground from solid pre-hardened bars of high speed steel. It's a drill that remains true and straight because it is fluted after hardening. Pre-hardening, then centerless grinding, eliminates distortion. Grinding the flutes into the solid bar produces a web that is concentric with its periphery. The grooves are symmetrical and the cutting lips are identical. The 12-inch Longboys cut to size even after repeated sharpenings.

The flutes are of regular construction and are highly polished for smooth chip flow.

The Longboy is a general purpose* drill that is very useful in a wide variety of deep hole jobs. The Longboy can frequently be used economically instead of special 8" or 10" drills. The unit price is the same for any quantity and is often less than the price of special, shorter drills—and delivery is from stock.

delivered from stock

IN 25 SIZES

1/8" to 1/2"

* *It should not be used to drill the harder alloy steels and forgings. (A special, heavy web crankshaft-type drill is recommended for these applications. Information and prices on request.)*

2255

ACE DRILL CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

13825 JENNINGS STREET DETROIT 27, MICH.

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Single, Double, Triple Actio

Mechanical Accuracy

Standard Design

Engineered to your Specifications

DANLY MACHINE SPECIALTIES, INC.

2100 So. 52nd Avenue • Chicago 50, Illinois

The Press for Moder

PRESSES

Production

TOOL KITS CUT COSTS

Faster, better tool service
no production delays
less cost – fewer attendants

thru McCASKEY

The tool control system adopted by the Van Norman Company, Springfield, Mass. for the exceptionally severe requirements of machine tool and automotive equipment production, is described by Mr. Mitchell Mastalerz in the August 15, 1946 issue of American Machinist. The following abstracts indicate how McCaskey Tool Control has assisted in achieving their objectives:

OBJECTIVES

1. Delivery of tools to machines in maximum of 1-hr.
2. Least possible loss of productive time for men and machines.
3. Advance planning & preparation of tools to reduce set-up time where as many as 40 tools are required.
4. Essential tool crib records accurate and up to the minute.

ACCOMPLISHMENTS

1. Tools from 2 cribs issued in carefully engineered and permanently recorded kits.
2. Kits designated by part and operation number and issued on one tool loan order by number with copy of tool list.
3. Special procedure for kits including expensive carbide tools and cutters provides for their use on several operations.
4. Previous experience: 60 delays in a day from tool shortages. Current performance: only 2 or 3, most of them unavoidable, rarely from failure of scheduling or tool service.
5. Lost time at machines decreased; overall efficiency of Operating Department increased.
6. Tool cribs now are giving faster, better tool service, serving the same number of employees and comparable production at less cost and with fewer crib attendants than required by old check system.

For complete details write for a copy of four-page reprint of the entire article, "Tool Kits Cut Costs"

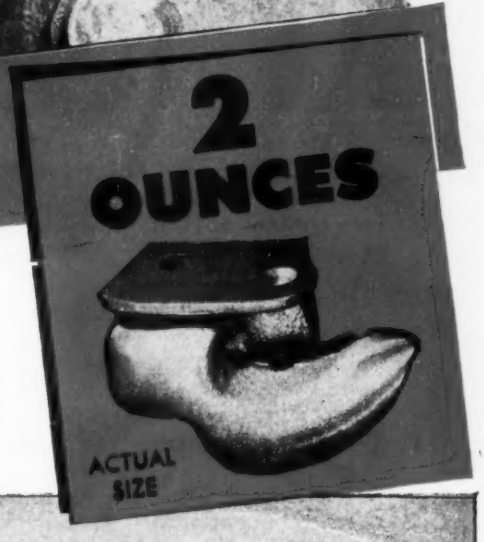
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

68 TONS or..

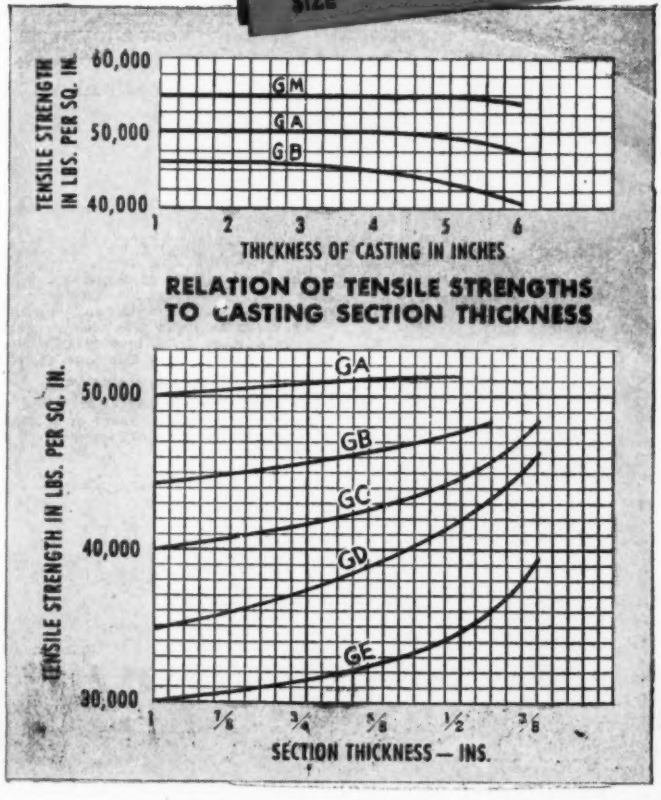


MEEHANITE ASSURES BETTER PROPERTIES!

The 68-ton Meehanite Casting illustrated forms the bed of a stone crusher capable of reducing large pieces of rock to crushed stone. Meehanite was selected because it provides the required high strength and wear resistance. Since the casting was machined at the quarry easy machinability was required.

In the small 2-ounce shuttle part, Meehanite manufacturing techniques provide the metallurgical control of structure and the "know how" in the other elements of foundry practice necessary to produce this casting in quantity and with the required characteristics.

Write for our new four-page bulletin "Meehanite Quality Control Assures Uniform Dependability."



MEEHANITE

Pershing Square Building, New Rochelle, N. Y.

No job for a Panty-waist

...so they put it up to Alloy Steel!

A BULLDOZER leads a shocking life! Just one obstacle course after another. Toiling up a steep grade one minute. Plunging into a ditch the next. Twisting and straining first against a mound of stubborn clay, then against a jagged heap of rock and debris. And often in the worst weather!

Certainly no job for a "panty-waist" . . . but a natural for U·S·S Carilloy Steels!

In seeking the unusual resistance to shock, abrasion and fatigue required by such rugged service, manufacturers of industrial tractors and heavy trucks turn to alloy steels. They have found in U·S·S Carilloy Steels their most comprehensive and reliable source of high quality special steels for giving optimum performance qualities to axles, bearings, gears, rods, shafts, sprockets and other vital parts. Frequently, with the help of our alloy specialists, heavy equipment builders have been able to improve strength and wearing qualities, and at the same time reduce deadweight and manufacturing costs. This same metallurgical counsel is available to you, without obligation.

What's NEW in Alloy Steels?

The Steel picture is changing rapidly. No one is closer to these important developments than U·S·S Carilloy specialists. It's their job to know what's new in alloy steels. They can help you give your products the full benefit of today's most significant metallurgical advances. If you would like to have this free assistance, write to us.

YOUR MOST COMPLETE SOURCE OF HIGH QUALITY ALLOY STEELS *U·S·S Carilloy Steels represent the widest range of sizes, and shapes available anywhere, and now are manufactured in all grades, finishes, and treatments.*

U·S·S Carilloy Steels

ALLOY STEELS FOR THE SPECIAL JOBS OF INDUSTRY

USS STEEL — UNITED STATES STEEL

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 PRESSES—E. W. Bliss Co., Detroit 2, Mich. 22-page catalog No. 27-A covers high-production presses from 8 to 300-ton. The presses are the 600 series designed to produce stampings requiring comparatively short strokes in large quantities.

2 MAN-AU-TROL SPACER—The Bullard Co., Bridgeport 2, Conn. 8-page bulletin describes semi-automatic movable work table which positions work in predetermined location under the spindle of various types of radial drills. The unit is said to result in greater speed and accuracy than is obtainable with jigs.

3 PUNCH PRESS — Woolley Div., Hammel-Dahl Co., Providence 3, R. I. 6-page bulletin describes Peterson Punch Press which has a maximum speed of 500 stampings per minute. It may be operated for hand feeding or continuous strip feeding.

4 NAILER — Milliken Machine Co., Boston 15, Mass. 4-page bulletin describes Model C high-speed precision nailer which will handle nails, pins, or rivets from 3/16 to ¾ in. in length.

5 MILLING ATTACHMENTS — H. Leach Machinery Co., Providence 4, R. I. Series of four, 2-page bulletins describe Fray "All-Angle" milling attachments, Type 1, 2, 3 and 4, for which H. Leach Machinery Co., is national distributor.

6 DRILLING MACHINE — Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn. 4-page bulletin describes Sigourney M-200 precision bench drilling machine. Two spindle-speed ranges and a variable-speed pulley give any spindle speed from 700 to 4,000 rpm.

7 BACKSTAND — Divine Bros. Co., Utica 1, N. Y. 4-page bulletin describes backstand and polishing lathes for use with backstand. Accessories are available to make a complete system for abrasive-belt polishing.

8 DRILLING MACHINES — The Taylor & Fenn Co., Hartford, Conn. 2-page bulletin describes M-125 high speed sensitive drill suitable for wire-sized drills and straight-shank drills up to ½-in. diameter.

9 CONTOUR SAWING — The DoAll Co., Minneapolis 4, Minn. 22-page booklet "DoAll Equals Ten Plus" shows type of operations which can be performed more economically by contour sawing.

10 BACKSTAND — Behr-Manning Corp., Troy, N. Y. 12-page booklet gives case histories of backstand installation in seven diversified industries.

11 THROATLESS SHEARS — Marshalltown Mfg. Co., Ia. 6-page bulletin illustrates and describes series of shears which have a sipral-shaped head. As the material passes through the shear, the sheared sections go to right and left, under and over the head, placing no limit on size of material to be sheared.

12 RIVETING MACHINES — The H. P. Townsend Mfg. Co., Hartford 1, Conn. 6-page bulletin describes line of riveters which will handle almost every type of riveting process. The machines are said to be able to do work which ordinarily must be done by hand.

TOOLS AND ACCESSORIES

13 CUTTERS—The Ingersoll Milling Machine Co., Rockford, Ill. 72-page catalog lists in detail standard inserted-blade cutters and illustrates many possible special cutters and deviations from standard.

14 DRILLING HANDBOOK—Cleveland Twist Drill Co., Cleveland 14, Ohio. Booklet answers hundreds of questions about twist drills, including grinding, correct feeds and speeds, and how to correct common errors.

15 TOOLS—National Twist Drill & Tool Co., Rochester, Mich. 282-page catalog contains information and data on twist drills, reamers, counter-bores, milling cutters, end mills, hobs, and other standard and special tools. Included are 60 pages of tables and charts on drilling, milling, and gears.

16 DIE SETS — Standard Machinery Co., Providence 7, R. I. 16-page catalog-section DS describes steel die sets, as well as feeds, scrap cutters, straighteners, and ground plates.

17 REAMERS — The Gammons-Hoaglund Co., Manchester, Conn. 16-page bulletin illustrates and describes helical taper pin reamers and allied precision tools.

18 AIR AND CLEANING GUNS — C. A. Claflin Co., Boston 10, Mass. 8-page bulletin describes air-blow guns for removal of chips and dust from inaccessible places, and cleaning guns with penetrating jets that wash away grease, dirt, and grime.

19 CIRCULAR TOOLS—Circular Tool Co., Inc., Providence, R. I. 40-page catalog covers circular tools in both high-speed and carbon steel, from ⅛- to 10-in. diameter. Also included are center drills and reamers.

20 GRINDING DATA—Simonds Abrasive Co., Philadelphia 37, Pa. 127-page booklet contains information on grinding wheels and grinding practices. Includes a wheel-selection table.

21 HEADSTOCK CENTER—Compensating Stop Center Co., Hartford 5, Conn. 4-page bulletin illustrates center which has positive stops which is said to achieve accurate dimensions on work in which center holes vary as much as 1/16 in.

22 HACKSAWS, BANDSAWS — The Capewell Mfg. Co., Hartford 2, Conn. 48-page booklet includes specification data and many helpful hints on blade selection and use.

Example

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FREE LITERATURE

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23 STITCHING—Bostitch, East Greenwich, R. I. 4-page bulletin, "Stitching Through Steel" describes process of fastening thin steel sheets together or steel to other materials. 8-page bulletin describes line of stitching machines.

24 TOOLPOST TURRET—S. G. Colwell, Providence, R. I. 4-page bulletin describes toolpost turret made in four sizes each of which holds four tools. They fit 9- to 20-in. lathes.

25 CUTTING TOOLS — Wendt-Sonis Co., Hannibal Mo. 48-page catalog No. 445 covers line of carbide-tipped cutting tools. Tools are protected with plastic covers.

26 CUTTING TOOLS—Willey's Carbide Tool Co., Detroit 1, Mich. 40-page catalog No. 29 covers line of tungsten-carbide tools. The carbide is made in six grades.

27 GRINDING—Norton Co., Worcester 6, Mass. 108-page handbook on abrasives and grinding wheels contains general discussion and reference table. Includes information on operating rules and grinding hints.

HEAT-TREATING AND WELDING

28 GAS APPLIANCES—Johnson Gas Appliance Co., Cedar Rapids, Iowa. 24-page catalog No. 47 illustrates and describes line of furnaces, burners, blowers, torches, mixers, and valves. Specifications are included for each item.

29 BRAZING—A. H. Hyndman Co., Inc., Chicago 28, Ill. 4-page bulletin describes brazing service including furnace, induction, and torch brazing, and bright annealing and induction hardening.

30 WELDING PROCEDURE—Ampco Metal, Inc., Milwaukee 4, Wis. 4-page bulletin "Ampco Procedure for Welding Silicon Bronzes" and 3-page bulletin "Ampco Welding Procedure for Beryllium Copper," give detailed welding data.

31 SALT BATH CONVEYORS—The A. F. Holden Co., New Haven 8, Conn. 34-page booklet describes simplified conveyor system for conventional heat-treating, austempering, martempering, flow heat-treatment, liquid carburizing, and cycle-annealing.

32 WELDING CONTROL — General Electric Co., Schenectady, N. Y. 12-page booklet "The Importance of Control in Resistance Welding" gives general discussion of the types of control required.

33 WELDING ELECTRODES — Jessop Steel Co., Washington, Pa. 8-page bulletin on stainless steel welding electrodes discusses selection procedure and gives data on line of electrodes.

PLANT SERVICE EQUIPMENT

34 MATERIALS HANDLING — The Louden Machinery Co., Fairfield, Iowa. 44-page booklet describes monorail system of conveyors with automatic control. Units travel from point to point by the shortest route with automatic operation of track switches, doors, and other functions.

35 SHOP EQUIPMENT — Standard Pressed Steel Co., Jenkintown, Pa. 40-page catalog covers "Hallowell" steel shop equipment including benches, stands, welding tables, dollies and other equipment.

36 INDUSTRIAL TRUCKS—Crescent Truck Co., Lebanon, Pa. Two 4-page bulletins describe Model LGVH and MGVH "Palletier" fork trucks available in capacities from 100 to 4000 lb.

37 DUST COLLECTION—Torit Mfg. Co., St. Paul 2, Minn. 22-page catalog No. 31 describes self-contained dust collectors for grinding, cutting, and polishing wheels.

PARTS AND MATERIALS

38 BALL BEARINGS—Jack & Heintz Precision Industries, Inc., Cleveland 1, Ohio. 8-page catalog 2000 describes line of anti-friction bearings and gives specifications. Includes description of electronic ball sorter and inner race gage.

39 AIR CYLINDERS—Hanna Engineering Works, Chicago 22, Ill. 24-page catalog No. 234 gives complete specifications and operating data for line of air cylinders.

40 PROTECTIVE PACKAGING — Coatings Div., R. M. Hollingshead Corp., Camden, N. J. 4-page bulletin describes "Cocoon," a plastic coating applied by spray gun or dip which will bridge gaps as large as 20-in square.

41 VOLTAGE STABILIZERS—Raytheon Mfg. Co., Waltham 54, Mass. 8-page bulletin describes units which control fluctuating voltage to plus or minus ½ percent.

42 UNIONS—E. M. Dart Mfg. Co., Providence, R. I. 12-page catalog B-50 describes line of Dart unions with two bronze seats ground to form a ball joint which is said to be leak proof and non-corroding.

43 LUBRICATION — Bijur Lubricating Corp., Long Island City 1, N. Y. 4-page bulletin 4B describes window units for visibility of liquid level or flow, or for observing internal moving parts. They are mounted in a plain bored or reamed hole.

44 COUPLINGS — Crocker-Wheeler Electric, Div. Joshua-Hendy Iron Works, Ampere, N. J. 4-page bulletin describes resilient flexible couplings which consist of a spider, a flange, a ball retaining cover, and six synthetic rubber balls.

45 BEARING DATA—The Torrington Co., Torrington, Conn. 154-page book "Engineering and Application Data" contains much data on needle bearings, giving standards and applications.

46 CRYSTAL FINISHES—Hilo Varnish Corp., Brooklyn 6, N. Y. 4-page bulletin No. 8 describes treatment of rough, non-porous surfaces with black or clear crystals for a sparking effect.

47 COLOR FOR INDUSTRY—U. S. Gutta Percha Paint Co., Providence, R. I. 16-page booklet describes choice of colors for painting walls, floors, machines, and other plant areas.

48 PLYMETL—Haskelite Mfg. Corp., Grand Rapids 2, Mich. 12-page bulletin describes line of Plymetl panels which combine light metal and wood sheets.

49 HEAT-TREAT FIXTURES—Hoskins Mfg. Co., Detroit 8, Mich. 28-page catalog No. 101 describes heat-treat fixtures, carburizing pots, carburizing boxes, melting pots, trays, and patterns made from Hoskins alloys.

50 FLEXIBLE COUPLINGS—American Flexible Coupling Co., Erie, Pa. 32-page catalog No. 461 describes line of flexible couplings, gives detailed specifications and describes special applications.

MISCELLANEOUS

51 PRECISION CASTINGS — Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4-page bulletin describes precision castings made by this company and illustrates a variety of typical plaster precision castings and intricate designs.

52 CENTRIFUGAL CASTINGS — Shenango-Penn Mold Co., Dover, Ohio. 4-page bulletin No. 144 describes plain and alloyed iron castings produced by centrifugal or static methods.

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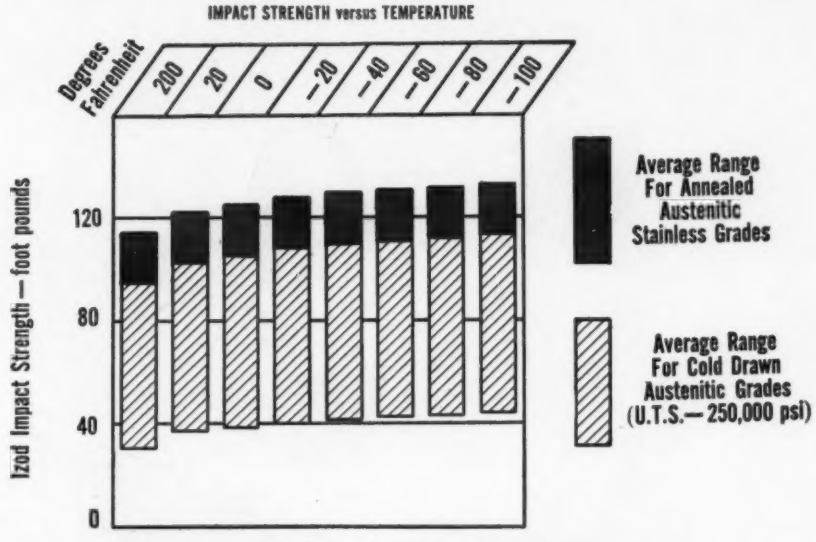
RUSTLESS DATA SHEET NO. 7

Corrosion Resistance Plus Strength at Sub-Zero Temperatures

One of the Many Combinations of Properties Offered by Stainless Steels



Applies to types: 301, 302, 304, 309, 316, 321, and 347.

OPERATION of aircraft in the extreme cold of the stratosphere has placed more and more emphasis on engineering materials exhibiting high resistance to shock loads at temperatures many degrees below zero Fahrenheit. Also, equipment for handling liquefied gases such as oxygen, nitrogen, and hydrogen must operate at even lower temperatures . . . in the vicinity of —400° Fahrenheit. Ordinary steels have not been found suitable for essential working parts operating at such extremely low temperatures. They suffer material loss of toughness and become increasingly brittle as temperatures drop below zero.

At normal temperatures the austenitic or chromium-nickel stainless steels have extremely high toughness values—higher than any standard engineering alloy. As temperatures are reduced, a remarkable property of the austenitic stainless steels becomes apparent . . . toughness is further increased at sub-zero temperatures. Impact tests performed at reduced temperatures have indicated a continuous increase in toughness all the way down to —400° Fahrenheit. The results of some of these tests are shown on the above chart. Highest izod impact values are naturally obtained on annealed material, but even with material cold worked to 250,000 psi tensile strength, it is possible to obtain over 40 ft. lbs. izod impact strength at —80° Fahrenheit.

The chart does not include Rustless 18-8 FM, Type 303, which is the free-machining counterpart of Type 302. However, both the sulphur and selenium bearing grades of Type 303 exhibit proportional increases in toughness with decreasing temperatures even though their initial impact strengths are somewhat lower than that of Type 302. Thus, valve parts to be machined on automatics and subjected to extremely low-temperature service can be made of Rustless 18-8 FM, Type 303 and outstanding performance can be expected.

Stainless steels offer many other desirable properties to designers: Strength and resistance to scaling at extremely high temperatures, durability, stiffness, sales appeal and, above all—economy. They are remarkably versatile everyday engineering materials. Many grades have been developed to fit varying service requirements and fabricating conditions. Rustless' specialized experience in stainless steels can help you select the proper grade for your purpose. Consult our technical service staff.

Yes, there are many grades of stainless steel. While they are commonly referred to by A.I.S.I. type number, some mystifying trade names are used. Therefore, to aid users in correlating trade names, type numbers and the principal Government Specifications we offer our helpful publication "Trade Names of Stainless Steels." Write for your copy today.

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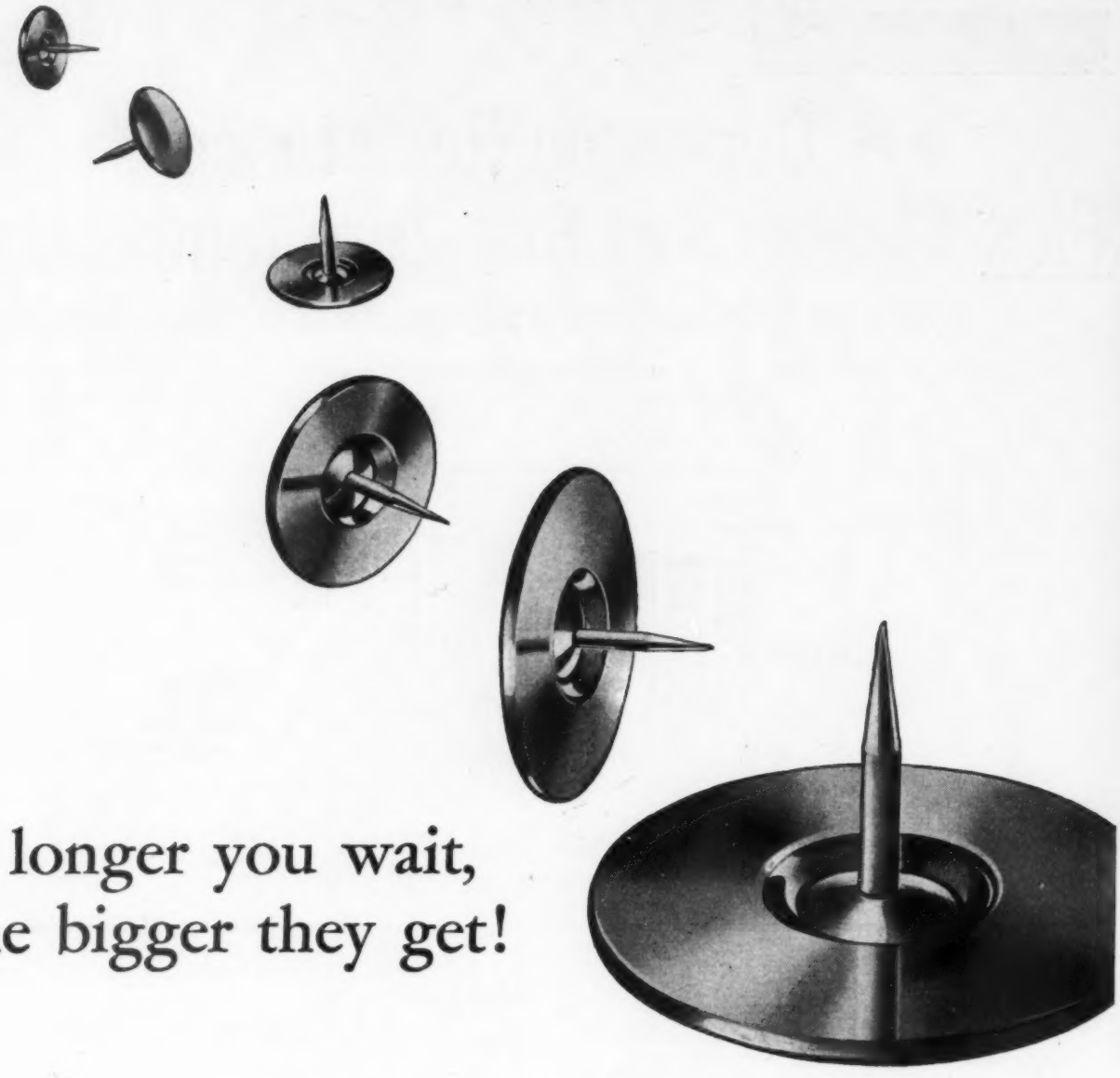
DIVISION OF ARMCO

RUSTLESS IRON AND STEEL DIVISION

THE AMERICAN ROLLING MILL COMPANY

Baltimore 13, Maryland

STAINLESS STEEL SPECIALISTS



The longer you wait, the bigger they get!

LITTLE things—brass tacks, burs, cotter pins—can loom large when lack of them means production delay.

That's why so many "little things" are carried in stock at Chase warehouses. Chase considers the miscellaneous item just as important as sheet or roll brass. And purchasing agents welcome the *extra* sales service.

Next time, check with Chase before shopping around. If your local Chase warehouse doesn't have what you need, they can probably get it for you from one of the 20 warehouses in this coast-to-coast network:

Big order or small . . . just pick up the phone and call the Chase Warehouse or Sales Office nearest you.

***Remember*— CHASE SERVICE IS AS CLOSE AS YOUR PHONE**

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BRASS & COPPER CO.
INCORPORATED

Waterbury 91, Connecticut
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

This is the Chase Network—handiest way to buy brass

ALBANY† ATLANTA† BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS JACKSONVILLE† KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON† (†Indicates Sales Office Only)

CUTAWAY SECTION OF PUSH-TITE AIR HOSE COUPLING

The HANSEN PUSH-TITE COUPLING

MARKABLE

remarkable Hansen Push-Tite Coupling has top honors as the outstanding coupling on market based on its performance—economical formance. That is the reason why there are e Hansen Couplings used by large and small ufacturing plants than any other coupling. Its plicity in design, ease of operation, "air savings" long trouble free life means speed, increased duction coupled with economy all along the line.

sen Push-Tite Coupling is unique in that it is and fast to operate, just a slight push of plug socket—it's connected, locked and air is auto- cally turned on. Slide sleeve back with thumb it is unlocked, disconnected and air is automatically shut off. There is no turning, adjusting or twisting of parts in order to connect, disconnect or to turn air on or off. It's all done by an easy push on plug to connect and a slight push on sleeve to disconnect. Complete swivel action prevents kinking of hose. Hansen Couplings will handle pressures from a few ounces to over 10,000 pounds without leaking.

Hansen Push-Tite air hose couplings are used for air, oil and grease. There are also other Hansen Couplings made to handle gasoline, acetylene and oxygen.

nd for FREE INDUSTRIAL CATALOG

HANSEN MANUFACTURING CO.

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CLEVELAND 14, OHIO

FERULOK THE NEW PARKER FLARELESS COUPLING

Here's a positive joint for all types of metal tubing—any wall thickness—even hard stainless steel.

The steel ferrule makes a controlled cut to form a shoulder on the *outside* of the tube wall. In this way a *permanent* seal is provided, regardless of draw marks or surface scratches on the tubing. When the nut is first pulled up, the ferrule cuts into the tube and locks—to form a *permanent* joint which will not leak, even after repeated reassembly. The joint is self-centering—a tight seal is assured even where tube wall thickness is not perfectly uniform.

When you want the safest in vibration-proof, high pressure flareless couplings get Parker Ferulok Flareless Couplings—at your jobbers—or write us direct for complete catalog information. The Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio. In Canada: Railway & Power Engineering Corporation, Limited, Montreal, P. Q.

Look for this famous trade mark. ALP, the initials of our founder, A. L. Parker, will remind you that for Alignment, Leak-protection and Pressure-tightness you can't beat Parker couplings and valves.

THE PARKER APPLIANCE CO.

CLEVELAND • LOS ANGELES

FLUID POWER PRODUCTS FOR ALL INDUSTRY

ONLY A SPRING *can hold it* TIGHT

Everything vibrates

Vibrating things wear loose—especially metal on metal. In your bolted assemblies the nut may never move, but vibration keeps wearing the other parts loose. Bolts stretch; burrs and flares rub down; paint, scale and rust pulverize. Looseness is inevitable—and if there's no spring washer it can be costly.

A strong spring washer expands as initial wear occurs, and it keeps expanding as fast and as far as wear continues—holding all parts tight longer.

Only a strong live spring washer can do this job. There is no substitute.

For real bolted security specify Kantlinks.

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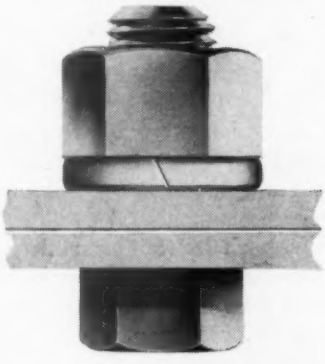
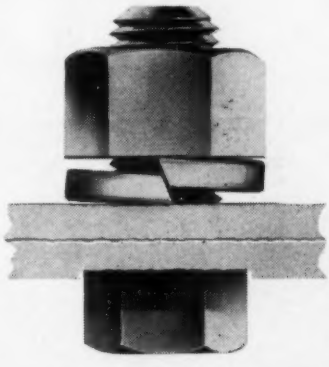


IT'S TIGHT—WRENCHED TIGHT

ORIGINATORS OF KANTLINK

THE LONG-RANGE SPRING WASHER

AFTER VIBRATION



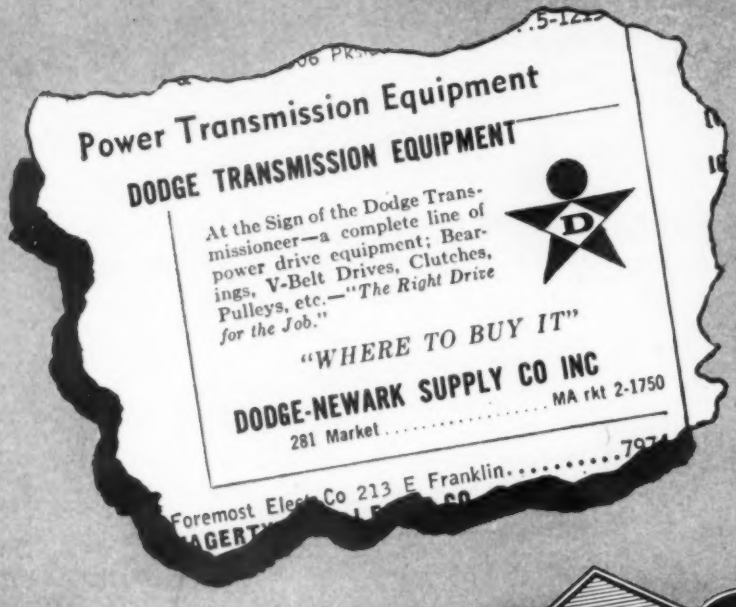
IT'S STILL TIGHT—THE SPRING EXPANDED, HELD ALL PARTS TIGHT

Made to accord with the new A S A specifications

THE NATIONAL LOCK WASHER COMPANY

Newark 5, New Jersey — Milwaukee 2, Wisconsin

Transmissioneering... what's *that*?


Power Transmission Equipment
DODGE TRANSMISSION EQUIPMENT
At the Sign of the Dodge Transmissioneer—a complete line of power drive equipment; Bearings, V-Belt Drives, Clutches, Pulleys, etc.—"The Right Drive for the Job."
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Transmissioneering means advanced design in power drives. The latest answers to problems in efficient mechanical transmission of power are available to you through 257 Dodge Factory Graduate Transmissioneers, located in principal cities throughout the country, who can help you put all your power into the job.

DODGE
MISHAWAKA

To obtain his diploma the Transmissioneer must pass searching tests in the construction and operation of all types of power drive units.

Copyright, 1946, Dodge Mfg. Corp.

Dodge power transmission equipment reflects 64 years of specialized experience. Dodge products are precision built, for efficient, dependable service. Dodge offers a broad line — bearings, sheaves, pulleys, clutches and other drive components.

The Transmissioneer is qualified by training and experience to create *the right drive for the job.* He will advise you, without obligation. When you have a problem in mechanical power transmission, in your plant or as applied to your product, call a Transmissioneer for the correct—and latest—answer. He is listed in your classified telephone directory under "Power Transmission Equipment."

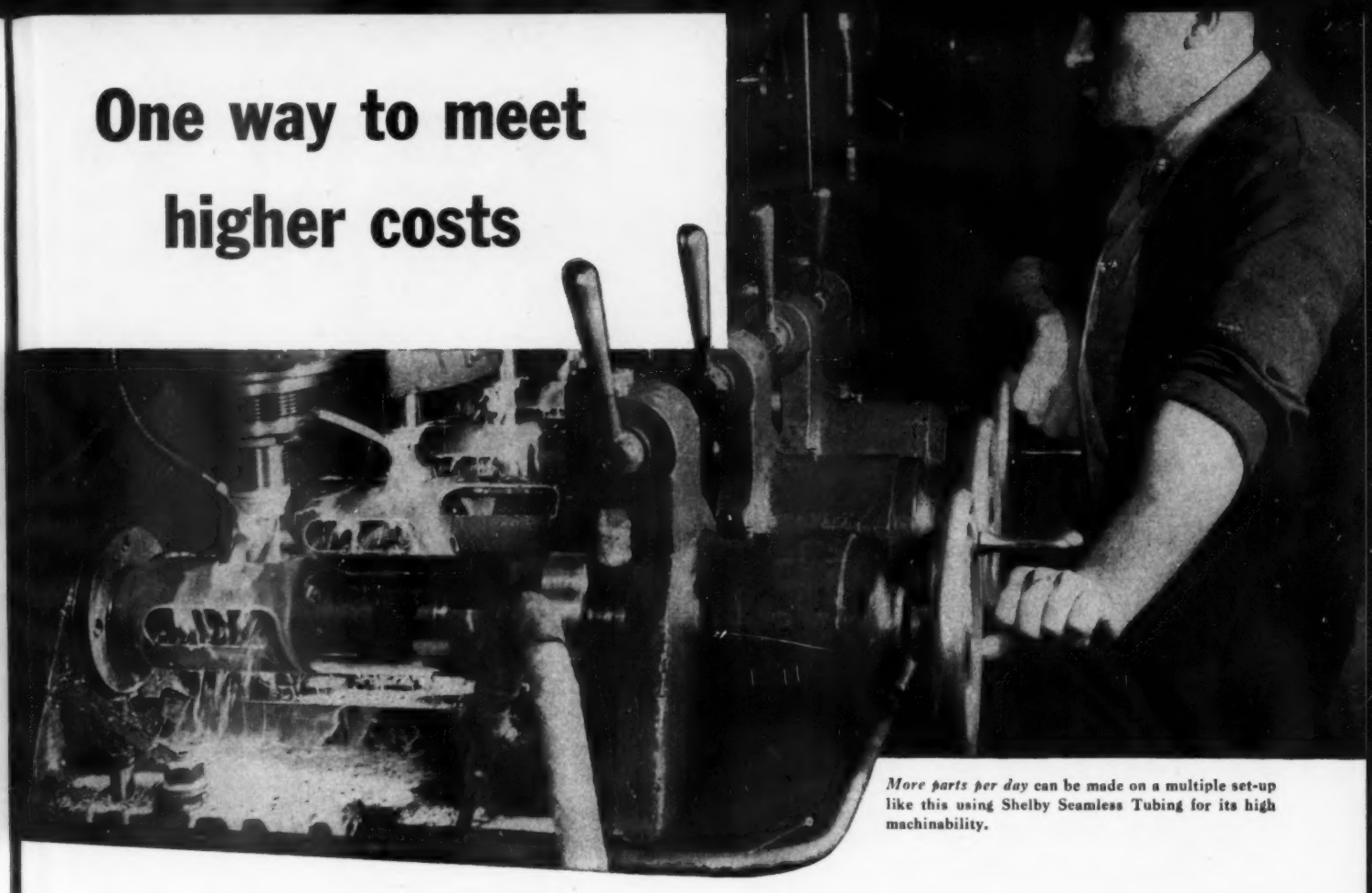
DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA

The Symbol That Came to Life
A NATION-WIDE SERVICE

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

One way to meet higher costs



More parts per day can be made on a multiple set-up like this using Shelby Seamless Tubing for its high machinability.

Use Seamless Tubing and get more production per man-hour

It takes ingenuity to figure out ways to combat rising costs, but you can profit from the experience of others.

During the war, manufacturers learned that seamless steel tubing had advantages over solid forgings on scores of new type jobs. Production was increased many times by set-ups such as the one illustrated above.

With Shelby Seamless Tubing you start out with the basic shape already made. This eliminates at least a forging and certain machining operations. The better machinability of Shelby Tubing and its uniform high quality permit fast production. Parts can be turned out at considerably less cost than those made by slower methods.

You can obtain Shelby Seamless Tubing processed to suit your particular requirements. Our service engineers work with you and with our own metallurgical department to develop the material most suitable for your machining operations.

Sizes of Shelby Seamless Tubing range from ⅜ inch to 10½ O.D. inches and in wall thickness from .035 inches to 1.500 inches cold drawn. Write for complete details and analyses available.

1. Connector for truck and trailer. 2. Roller for tractor. 3. Bearing shell. 4. Pump impeller. 5. Winder for textile machine.

SHELBY SEAMLESS *Steel Tubing*

WALLS WITHOUT WELDS

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Tubing Specialties Division

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
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In Sheave
Clearly, it's the sides of a V-Belt that do all the gripping on the pulley and get all the wear against the sheave-groove wall. That's why longer life for the sides means longer life for the belt!
THE
CONCAVE SIDE
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The SIDEWALL of Your V-Belt does MORE Work NOW than ever before!

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The moment you think about it you realize, of course, that the *sidewall* is the part of a V-Belt that really gets the *wear*.

It's the sidewall that has to grip the pulley. It has to pick up all the power from the driver pulley, transmit that power to the tension member and then deliver to the driven pulley all the power that pulley ever receives.

That is the perfectly natural reason why you have always noticed that the sidewall of the *ordinary* V-Belt is the part that wears out first. Clearly, anything that lengthens the life of the sidewall will lengthen the life of the belt.

The simple diagrams on the right show clearly why the ordinary, *straight-sided* V-Belt gets excessive wear along the *middle* of the *sides*. They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

Straight Sided V-Belt — FIG. 1

How Straight Sided V-Belt Bulges When Bending Around Its Pulley — FIG. 1A

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall — FIG. 2

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley — FIG. 2A

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

4610

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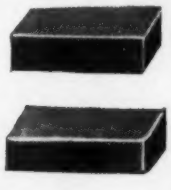

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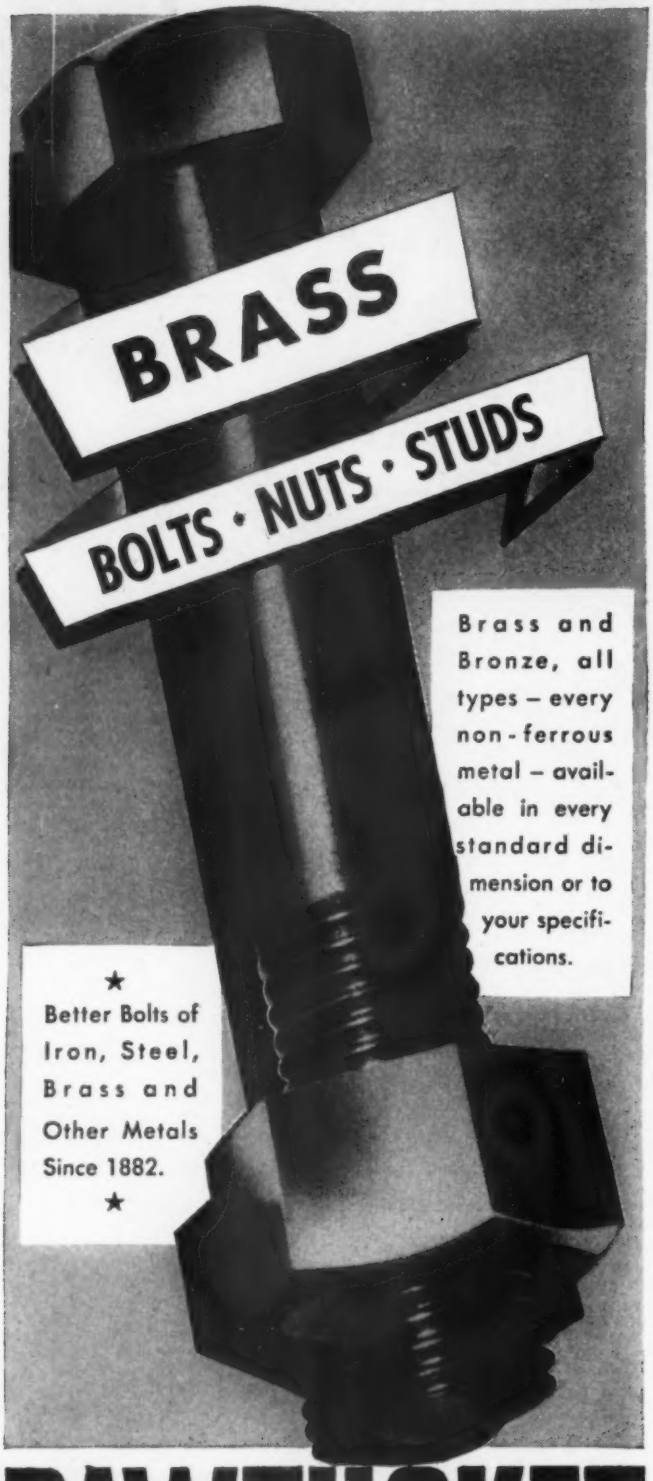
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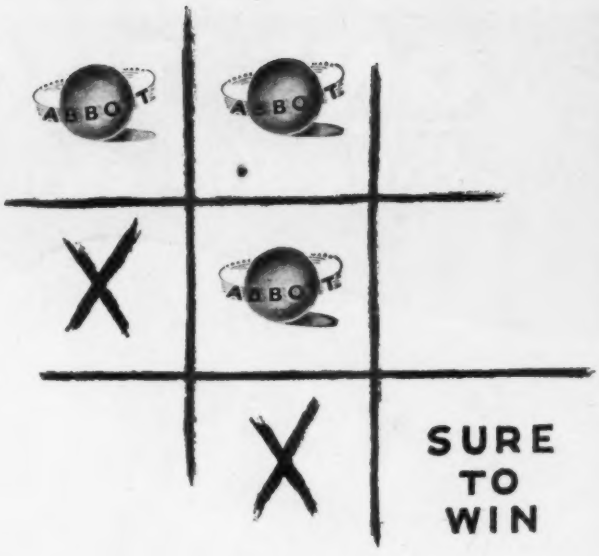

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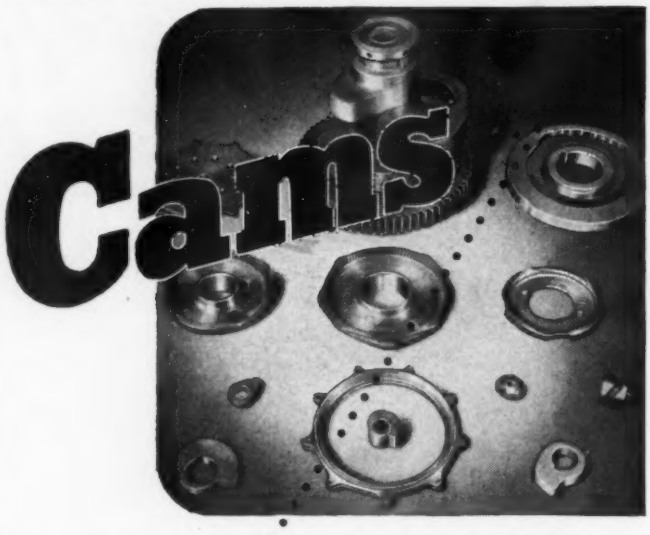

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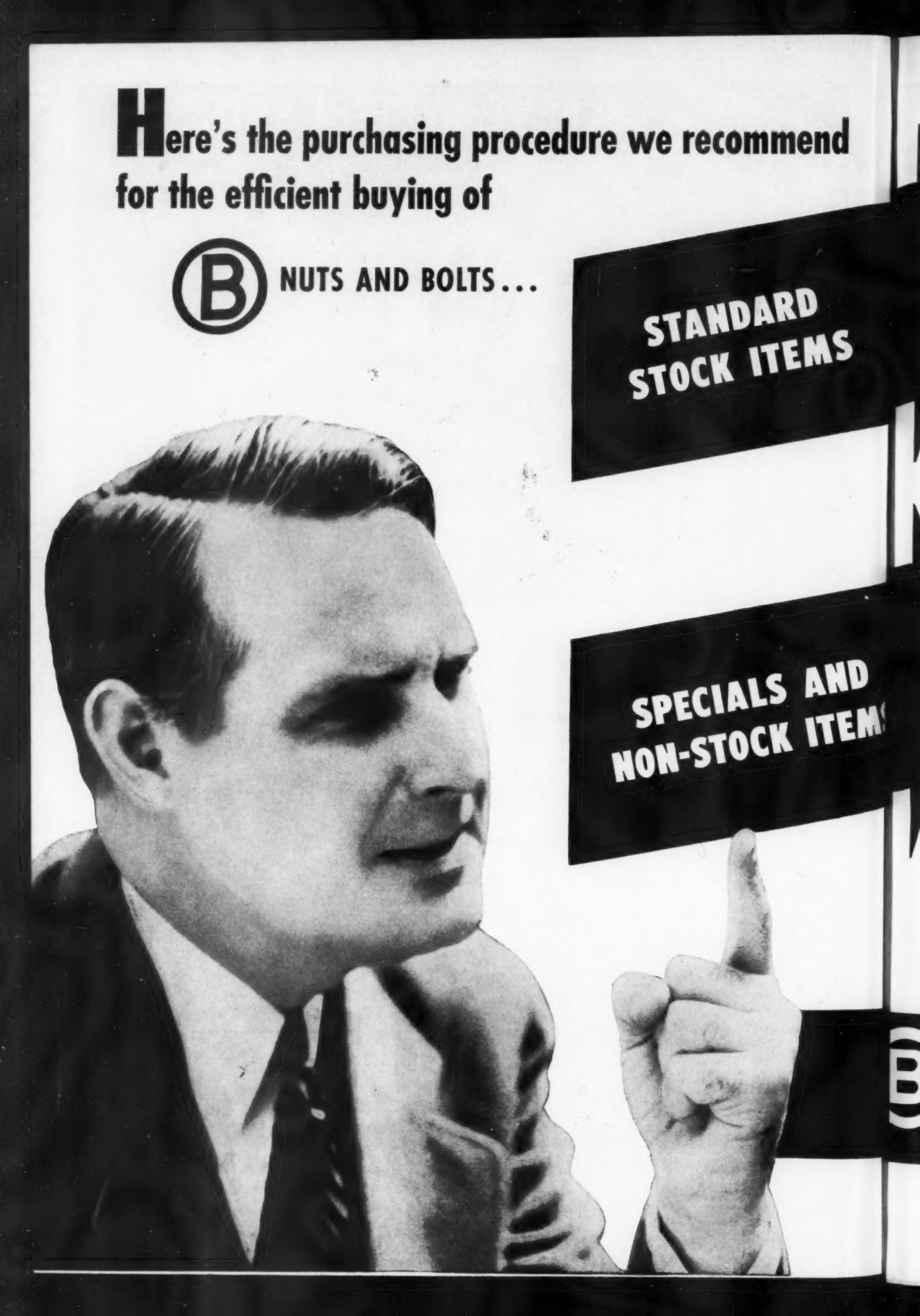

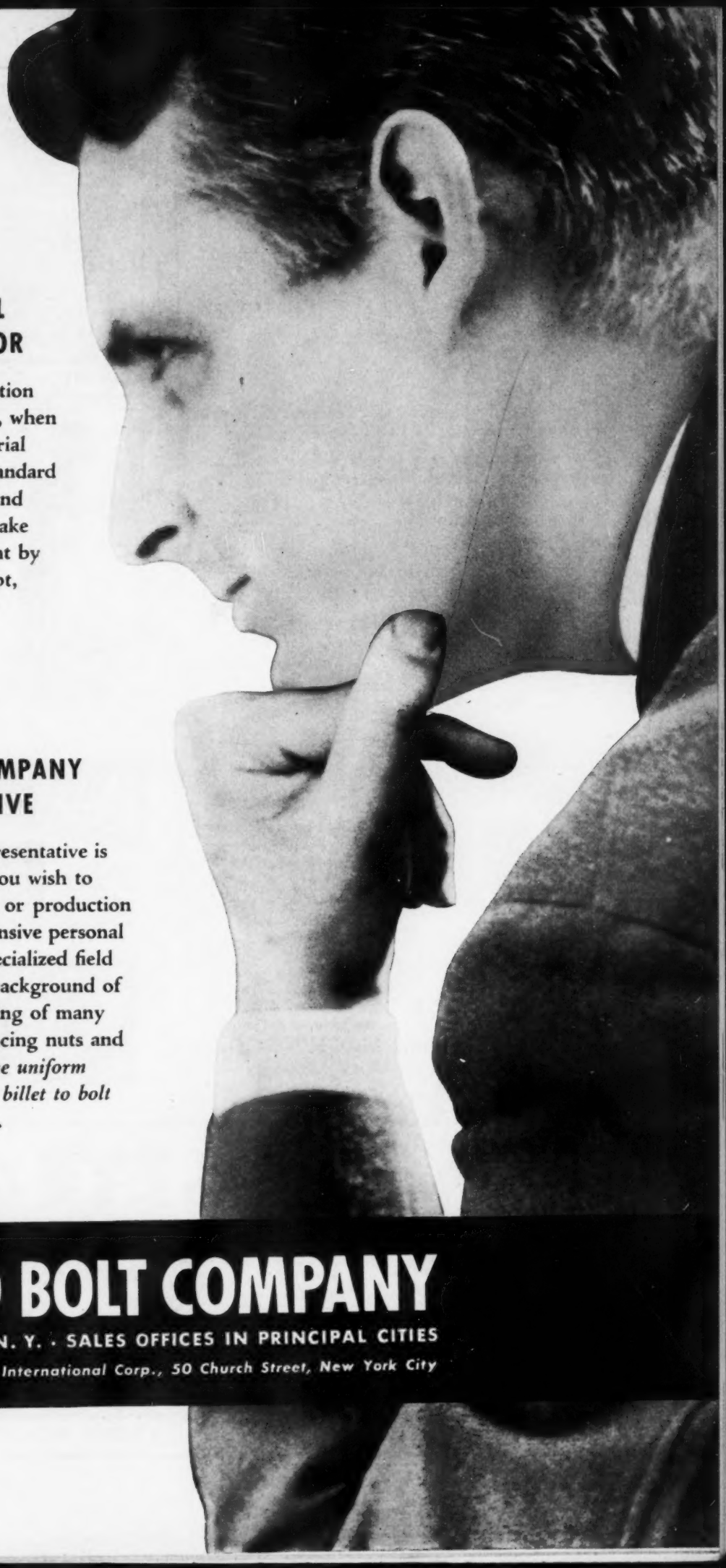

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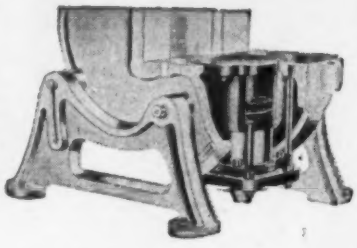

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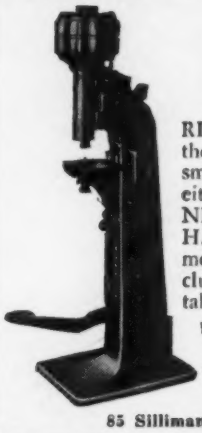

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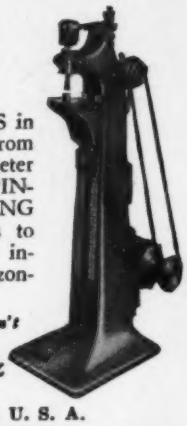

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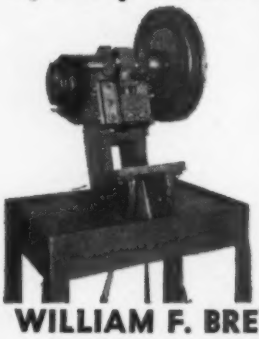

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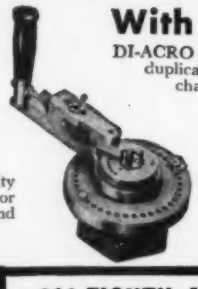

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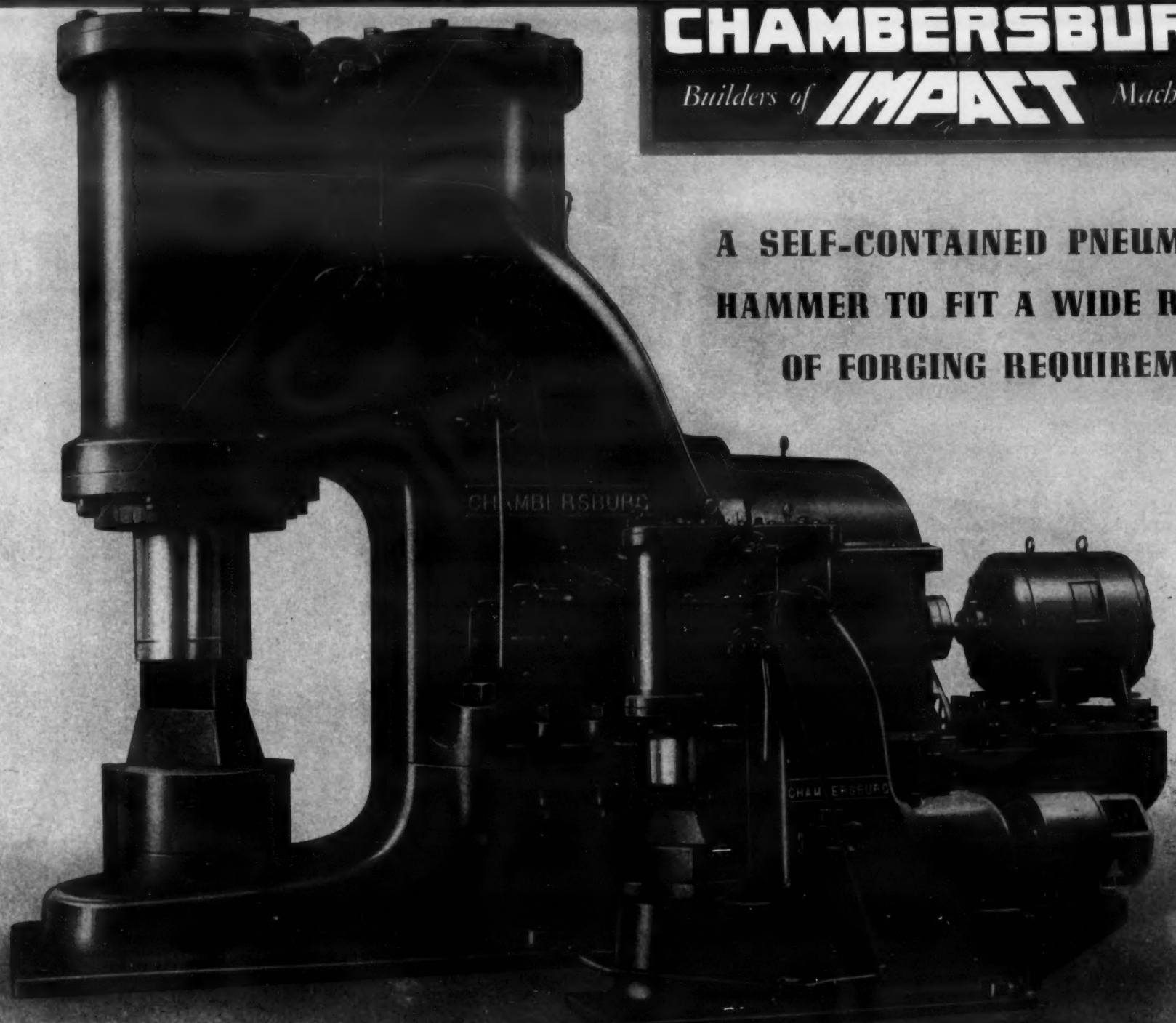

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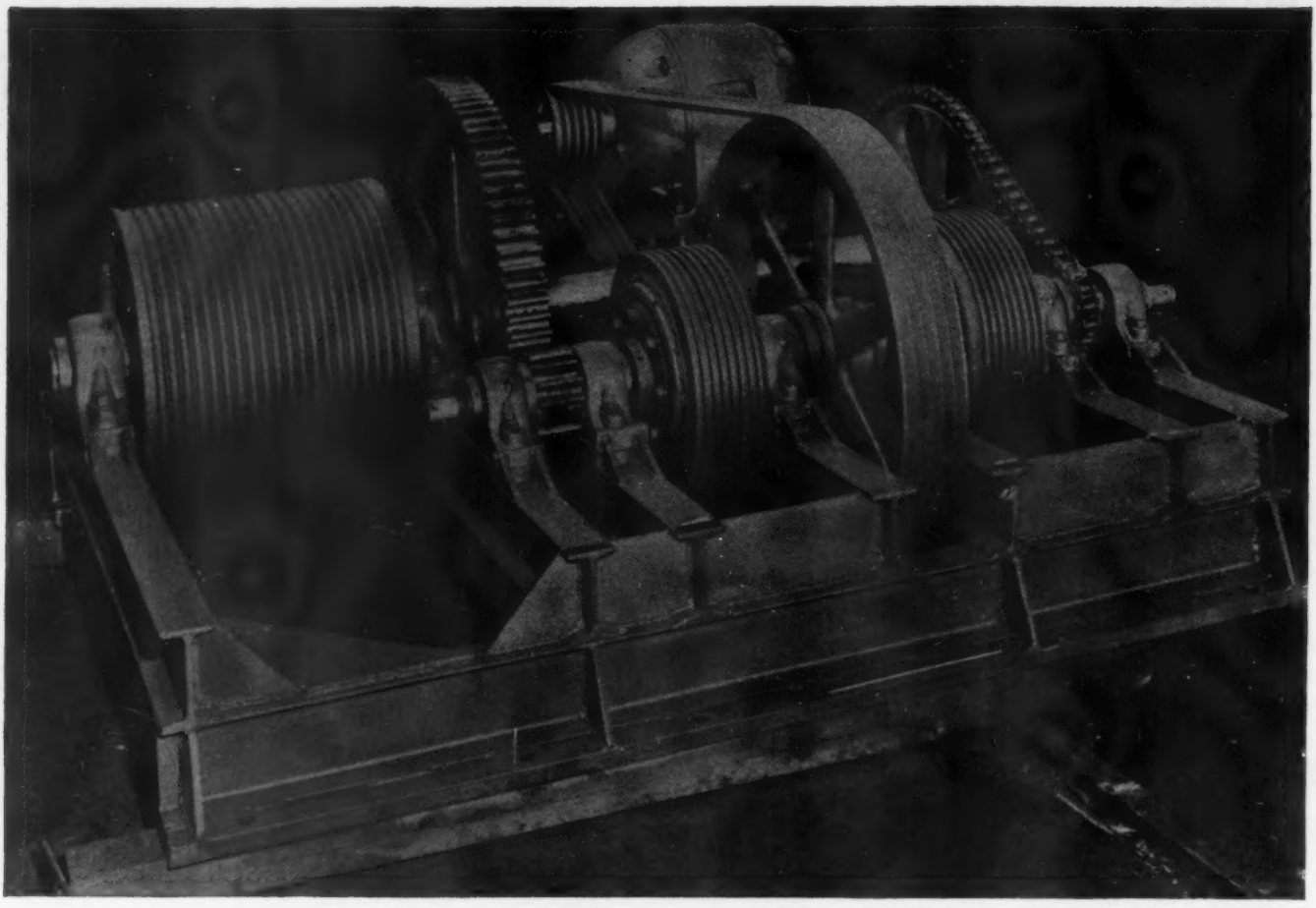

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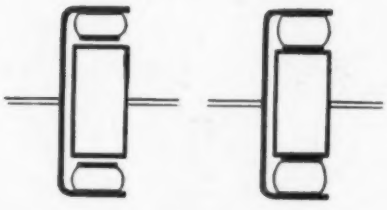

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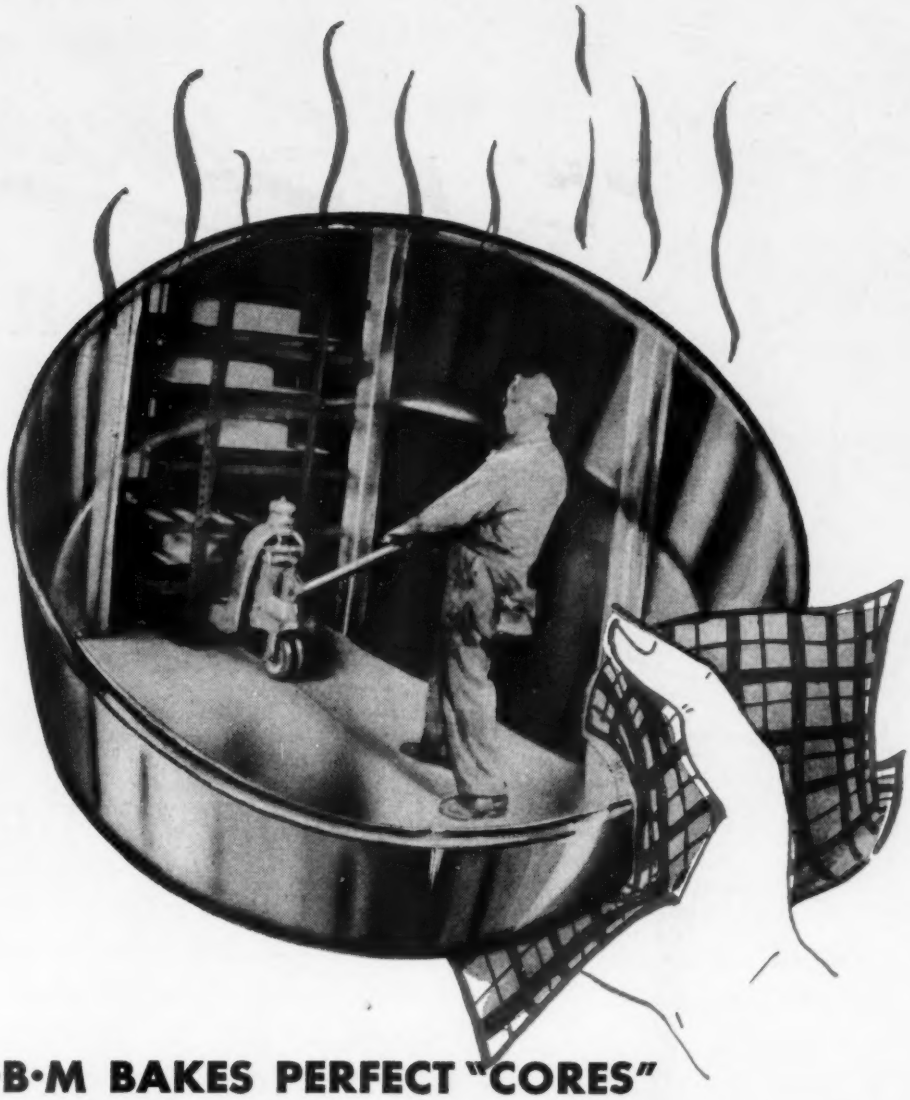

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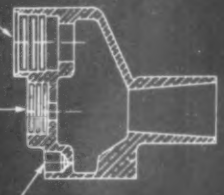

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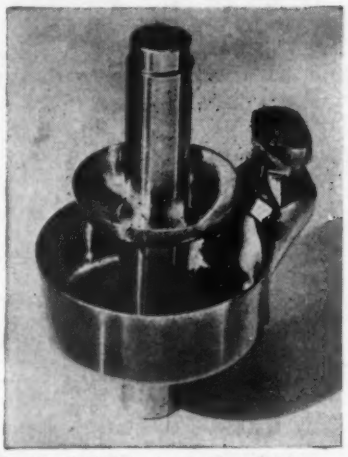

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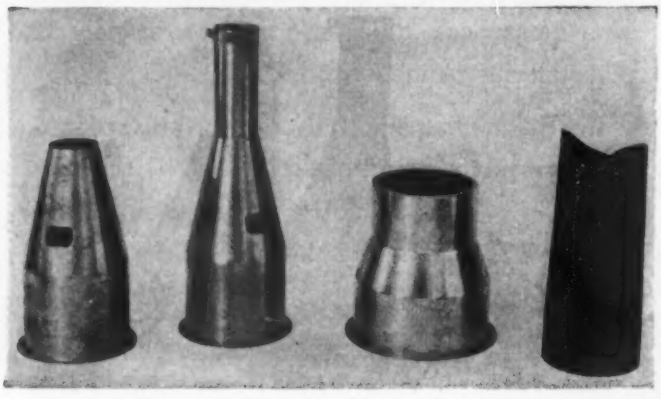

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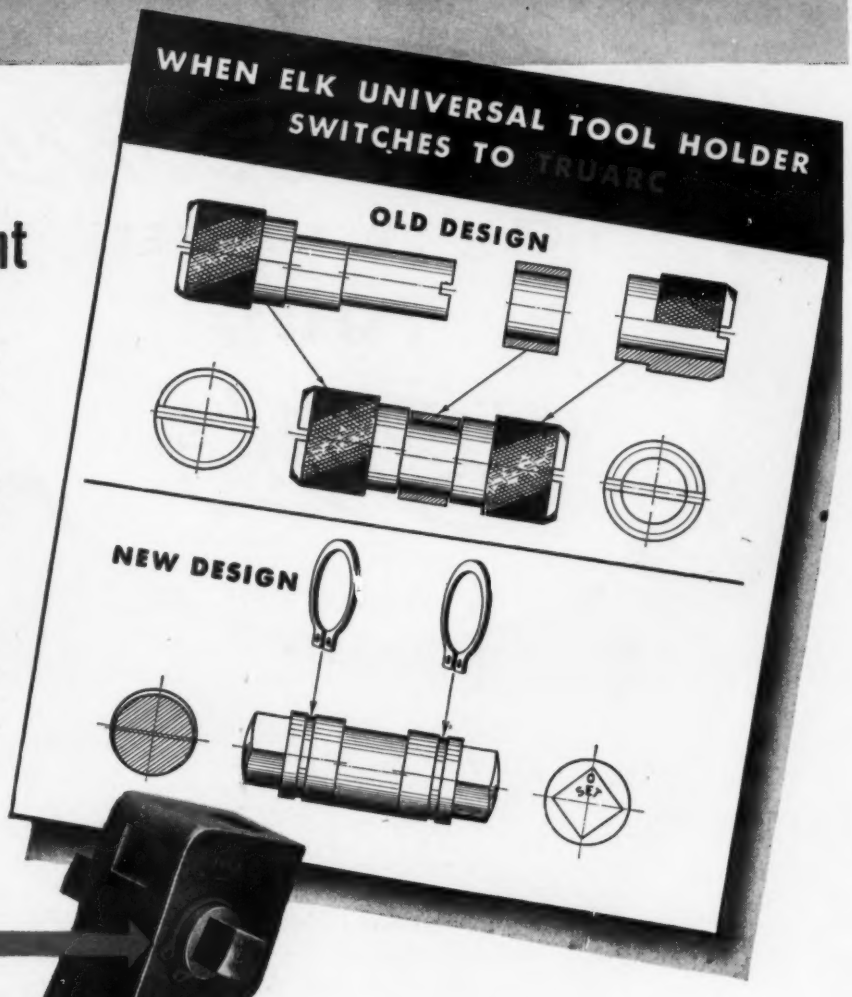

The advantages of this simple redesign were great for Elk Tools, Inc., New York. With Waldes Truarc Retaining Rings you too can reduce machining, save material, eliminate nuts, bolts, cotter pins and other uneconomical devices. Truarc's patented mathematical design assures a never-failing grip. Waldes Truarc engineers can help you improve your product, will give your particular problem individual attention without obligation.

WALDES TRUARC RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

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Waldes Kohinoor, Inc., 47-10 Austel Place, Long Island City 1, N. Y.
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HIGH SPEED STEEL TOOL Bits

NATIONALLY RECOGNIZED

● Every day brings more and different applications for GORHAM Tool Bits. Every day the list of GORHAM users lengthens. GORHAM'S reputation is nationwide. ★ ★ ★ The first time you use GORHAM High Speed Steel Tool Bits in your plant, you will see why they are the first choice of so many leaders in industry. GORHAM tools "prove by performance" . . . they demonstrate their superiority from the minute they start to work. ★ ★ ★ Check GORHAM quality at first hand. Test these tools on your toughest production job. The results will convince you!

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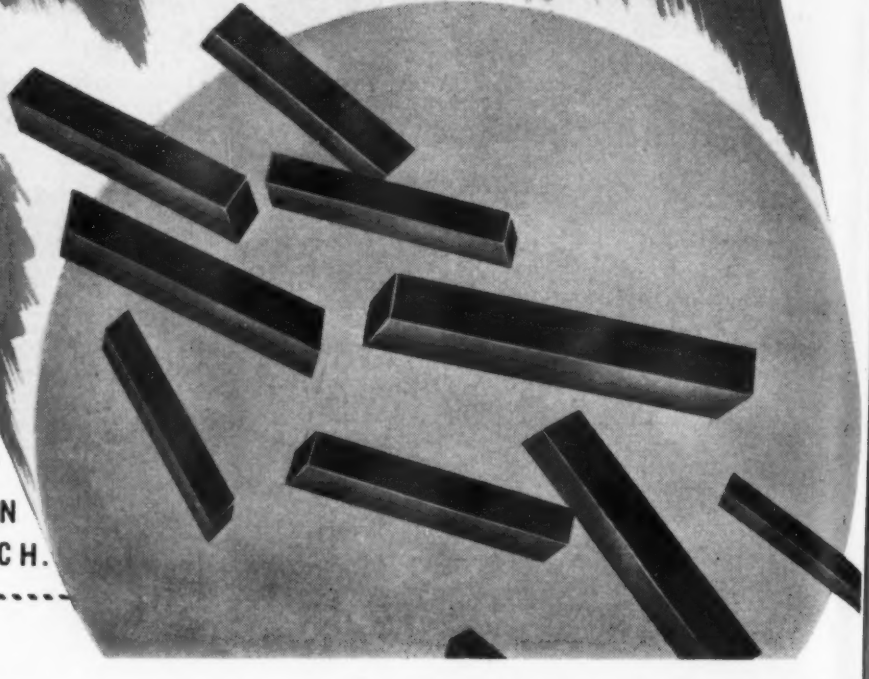

GORHAM TOOL CO.
14400 WOODROW WILSON
DETROIT 3, MICH.

COCOON, the amazing new protective packaging for anything from a ball bearing to a locomotive—applied with a spray gun—was developed during the war, when the delivery of munitions and foodstuffs in perfect condition meant the difference between victory and defeat. One example of the ever-expanding use of the COCOON System today is the packaging of machine tools for shipment to China, where, after an indefinite period of storage, they will be installed in Chinese factories.

COCOON requires only a spray gun and air supply! Bridges gaps up to 20 inches without difficulty! Assures full protection without grease coatings! Won't soften at plus 180°F.; remains flexible at minus 40°F.! Has extremely low moisture-vapor transmission rate! Resists attack by major mildew and mold groups! Tensile strength 2000 p.s.i.; elongation 200%! Equipment can be stored without dismantling! Imagine *your* product in COCOON! Submit your problem to us for analysis.

R. M. Hollingshead Corporation, Coatings Division, Camden, New Jersey; Toronto, Canada.

PACKAGE with COCOON!

A PRODUCT OF Hollingshead
LEADER IN MAINTENANCE CHEMICALS
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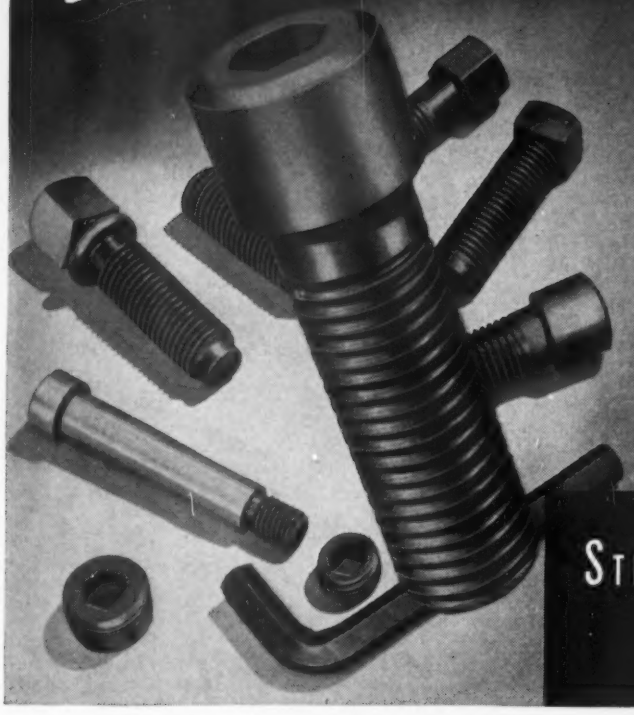
Mac-it ALLOY STEEL SCREWS



Greater strength, more compact design with SOCKET HEAD CAP SCREWS!

Mac-it Socket Head Cap Screws will give you added holding power and permit more compact design where necessary. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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OUT OUR WAY BY J. R. WILLIAMS

THE OLD BULL SURE SUFFERS WHEN HE HAS TO DO ALL THIS THINKIN'. HE'S FIGURIN' WHERE TO GET WHO TO PUT WHAT ON THEM MACHINES
THEN HE'S GOING TO SHIFT EVERYTHING BACK ON THE EXPRESS TRACK FROM NOW ON SO AS HE CAN FEEL HE'S BACK IN HIGH GEAR AGAIN
THE POKER FACE
J.R.WILLIAMS

The Old Bull Shifts Into High Gear

Nothing can keep the Old Bull on the slow-up for long. There's too much to do and waiting to be done. He's not comfortable out of high gear—when millions with money to spend are still starved for goods he can figure on making.

If you aren't finding it easy to "shift into high", perhaps we, at Ericsson, can help you. We can find ways to help meet your assembly costs by furnishing high precision parts on our economical mass-production basis.

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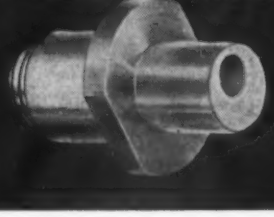

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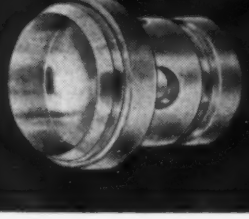
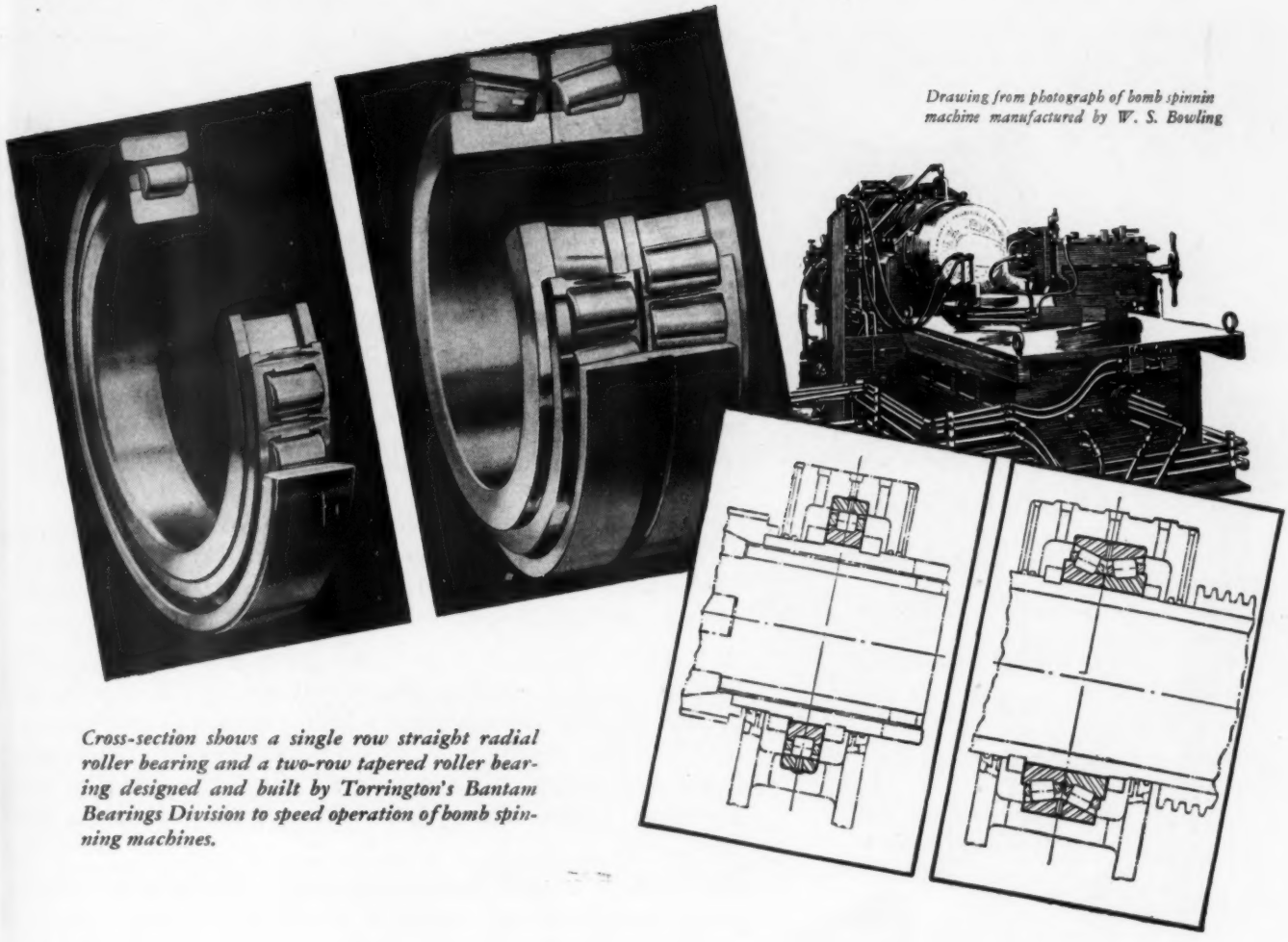




Drawing from photograph of bomb spinnin machine manufactured by W. S. Bowling

Cross-section shows a single row straight radial roller bearing and a two-row tapered roller bearing designed and built by Torrington's Bantam Bearings Division to speed operation of bomb spinning machines.

HIGHER SPEEDS FOR METAL SPINNERS

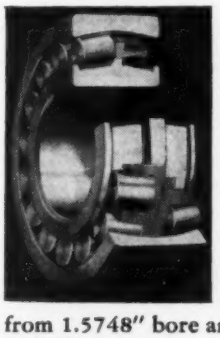
At the start of the war, Torrington was asked to design and build bearings that would enable the spindles of bomb spinning machines to operate at speeds up to then thought impossible. Soon, spindles equipped with large tapered and cylindrical Torrington Roller Bearings were turning at unheard-of speeds up to 1500 revolutions per minute, with equivalent pitch line speeds of 8000 feet per minute.

On the typical Torrington Bearing equipped spindle, the heavy alternate radial and thrust loads on the fixed end of the spindle are carried by a rugged, compact double row tapered roller bearing. A single row straight radial roller bearing supports the floating end of the spindle, allowing lineal expansion to take place without cramping. Special design features at the pocket corners of the bearing cage take care of the rapid alternation between radial and thrust load. A specially designed automatic controlled oil lubrication system handles the excessive heat generated by the unusual operating conditions.

Designing and building bearings to meet unusual antifriction requirements is the year-round job of Torrington's Bantam Bearings Division. Our help and cooperation are at your disposal, for ordinary or unusual projects.

THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION
SOUTH BEND 21, INDIANA

THE TORRINGTON
SELF-ALIGNING
SPHERICAL ROLLER BEARING



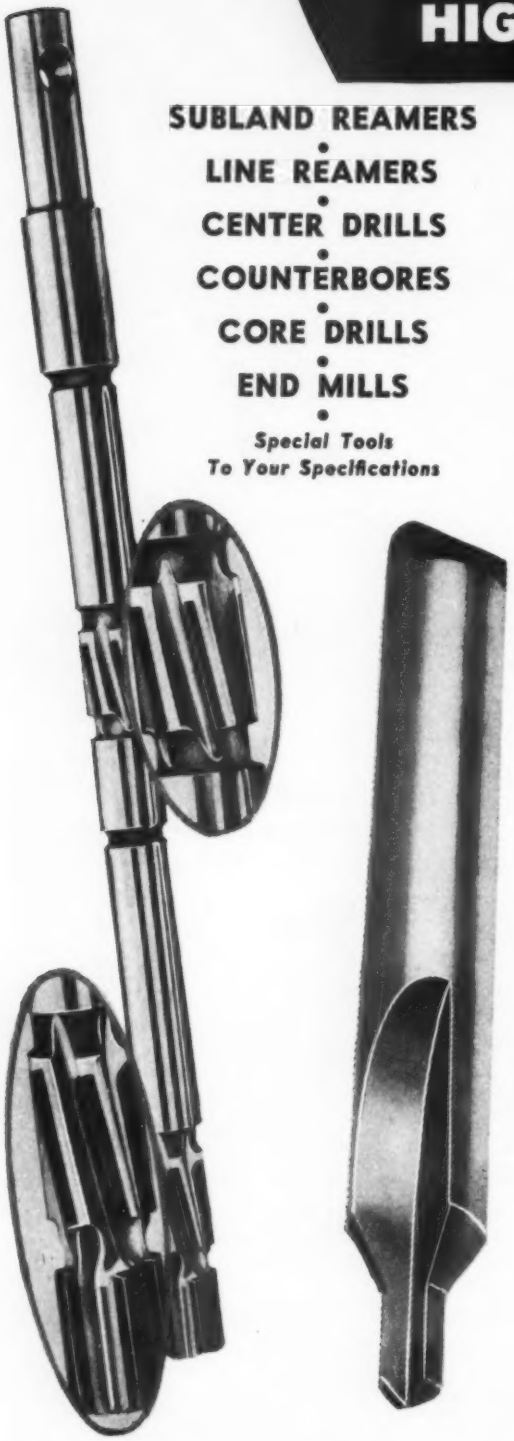
This latest addition to the Torrington line is a self-aligning bearing, specifically adaptable for heavy-duty performance. Sizes will be available to cover a complete range from 1.5748" bore and up. Write for Bulletin 200 or see your nearest Torrington Representative.

TORRINGTON BEARINGS

SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

Now!

CARBIDE-TIPPED TOOLS
BRAZED OH HARDENED
HIGH-SPEED STEEL BODIES



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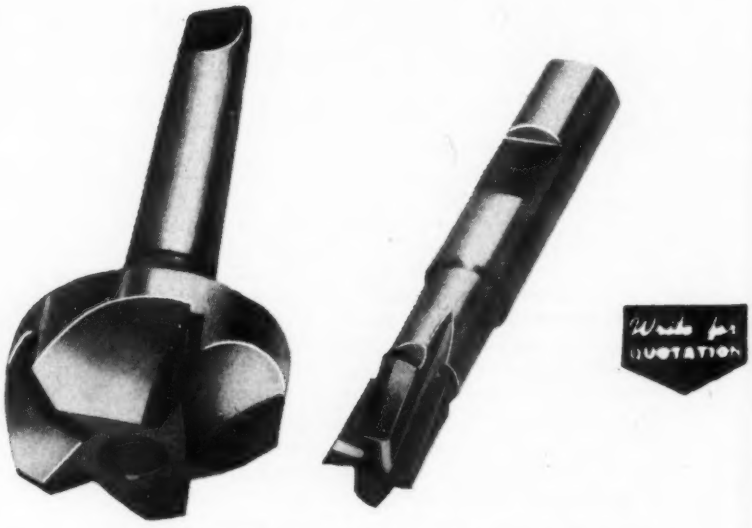
Special Tools To Your Specifications

AGAIN, Detroit Reamer & Tool Company sets the pace in metal cutting tools, with brazed carbide tips on hardened high-speed steel bodies, so that the total length of flutes and pilots will Rockwell C-62-63.

It has also been proved in actual practice that this type of tool has a higher cutting efficiency due to the harder background for the carbide tips which produces less "spring-back" under heavy cuts for this same reason. Also, the flutes and pilots will not "score" or pick up due to the hardness of the high-speed steel and long wear on the pilot.

All of these outstanding advantages, together with longer tool life and reduced production costs, are at your disposal with Carbide Tipped Cutting Tools, with HIGH-SPEED STEEL BODIES.

• ***MADE TO YOUR SPECIFICATIONS*** •



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Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools.

YOU GET *MORE* THAN JUST TOP-NOTCH ACCURACY WITH

Ettco-Emrick TAPPING ATTACHMENTS

Not only do you get clean and accurate threads with Ettco-Emrick Tapping Attachments, but you also get these three big "plus" features:

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2. EASY OPERATION—All the necessary tapping skill is built into Ettco-Emrick Attachments by special design features. That's why ordinary unskilled operators—men or women—can turn out fast accurate tapping with them.

3. ECONOMY—Ettco-Emrick Tapping Attachments not only save labor and materials, but they give you these savings at a very low first cost—because they work right on your presses like any other shank tool.

It's these "plus" factors that have made Ettco-Emrick Tapping Attachments favorites for so many years in shops throughout the country. They're a profitable investment for any shop. For full details, **WRITE FOR BULLETIN NO. 2**

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FOR No. 0 TO 1" TAPS

ETTCO TOOL CO.

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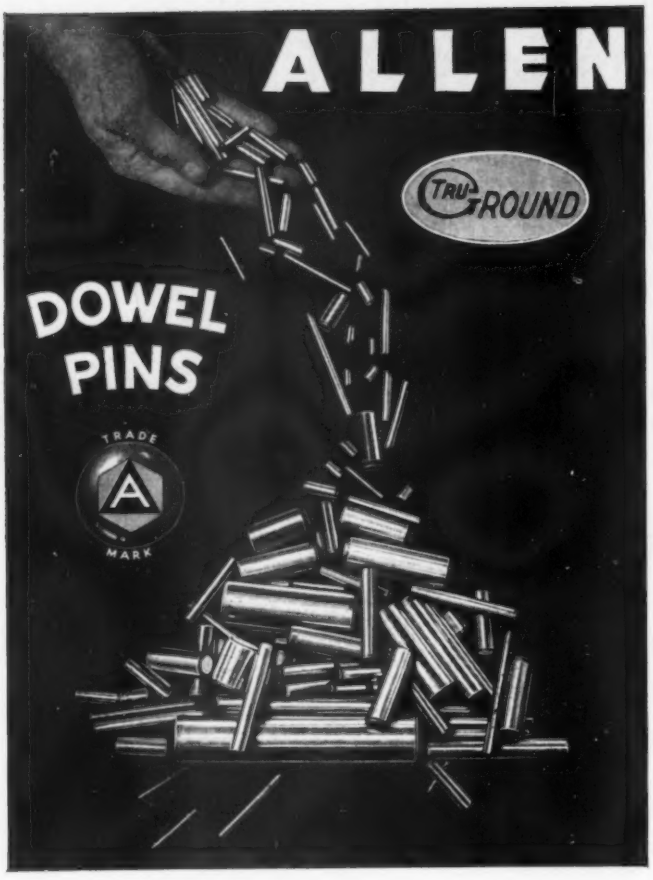
Over 25 years specialization in solving Industry's drilling and tapping problems



They serve as locating pins for the diemaker's work — and function further as perfect shafts for pins and pivots in various machine assemblies.

Accurate to a limit of .0002" over basic size, with allowable tolerance of plus or minus .0001". Ground, polished surfaces, treated with rust-preventive. Heat-treated to an extremely hard exterior, with core of the right hardness to prevent "mushrooming" when driven into a tight hole. Tensile strength, 240,000 to 250,000 p. s. i. Steeled to *retain* precision standards in tool and die work; special-analysis ALLENOY steel used exclusively.

Ask your local ALLEN Distributor for samples and dimensional data . . . the same Distributor who serves you dependably with Allen Hex Socket Screws and other first-call mill supply items.

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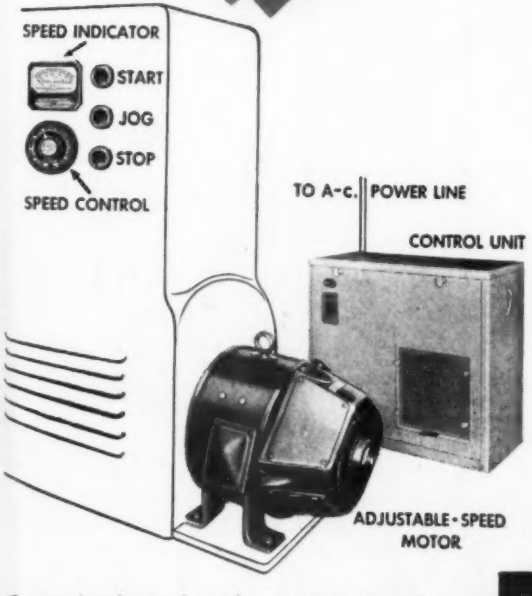
RELIANCE V★S DRIVE



Conveniently-packaged, space-saving V★S Drives available in Rotating or Electronic Systems or a combination of both.

V★S, the *All-electric, Adjustable-speed Drive operating from A-c. Circuits,* brings to any production or processing operation an unlimited selection of *stepless* speed changes. Acceleration and deceleration are unbelievably smooth. And every V★S function can be performed automatically or manually, with all-electric control from nearby or remote stations!

Whatever flexibility of operation you need to increase quantity and quality of output can be provided the V★S way—simply, safely and economically. V★S control means instantaneous starts and stops—slow speeds for inching, threading or close inspection of work in process—maintenance of proper tension—reversal at any point desired. For more money-saving facts about the V★S Drive write for Bulletin 311.

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"Motor-Drive is More Than Power"

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CARBOLOY TIPPED
CEMENTED CARBIDE
TOOL-BIT-TYPE

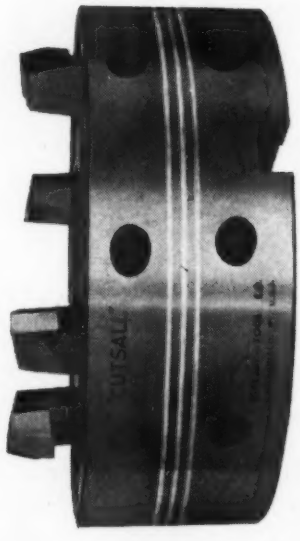
"CUTSALL" STEP TOOTH MILL

Here's another new "Cutsall" to cut your milling costs. The staggered teeth give the results of four single fly cutters—with metal removing ability that will outstrip anything you've ever tried.

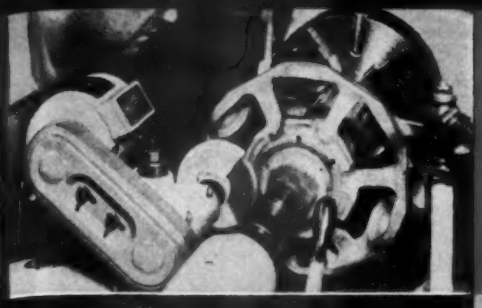
Lovejoy "Cutsall" mills have large Carboloy tool-bit-type blades that can be supplied for right- or left-hand cutting, *with the same housing.* The blades can be ground easily to obtain positive or negative rake. The rear on each blade is tapered so that fine adjustment is easily made with rear set screw—front set screw securely locks the blade in the housing. (See phantom view, below.)

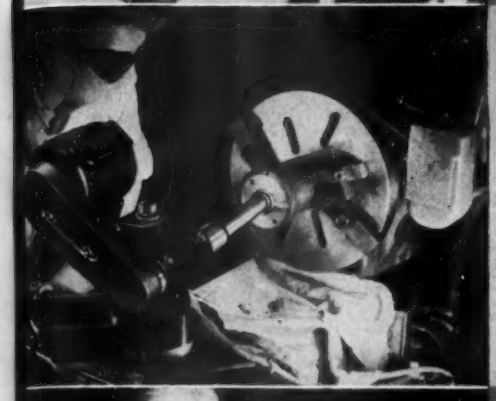
"Cutsall" face and step tooth mills are available in 6", 8", 10" and 12" sizes—*all take a single blade size*—all will give performance unmatched by any other mills. Write for details and prices.

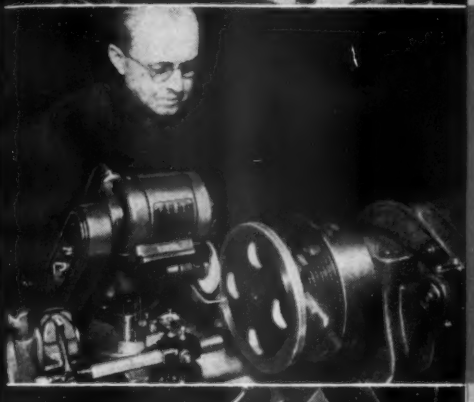
- POSITIVE and NEGATIVE RAKE, RIGHT and LEFT
- HAND in *ONE* HOUSING
- FINE BLADE ADJUSTMENT
- EXTRA LARGE CARBOLOY TIPS

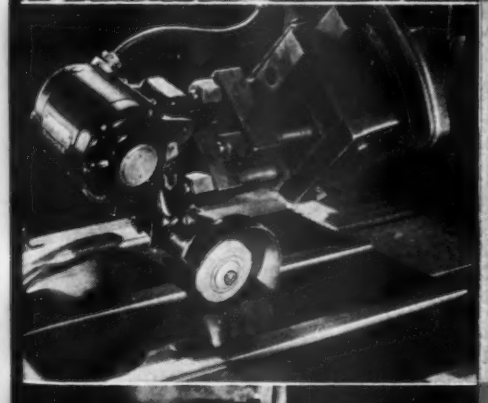


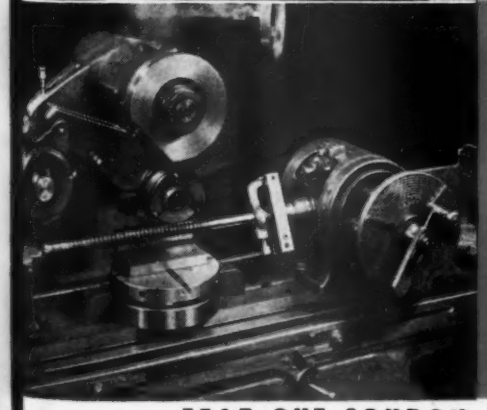
LOVEJOY
TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

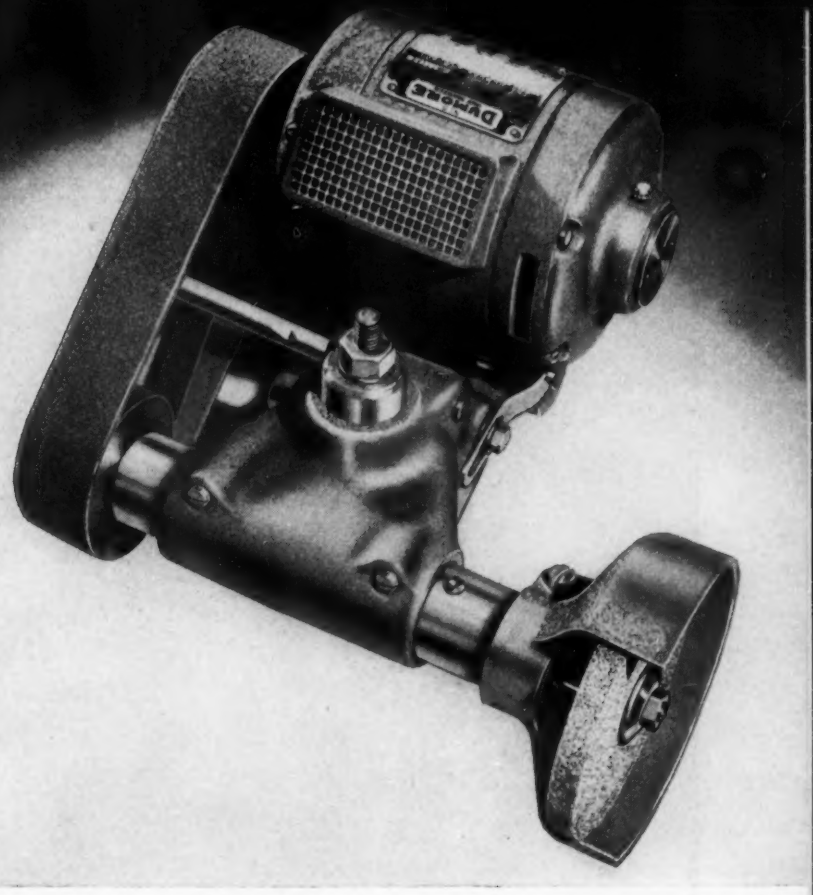












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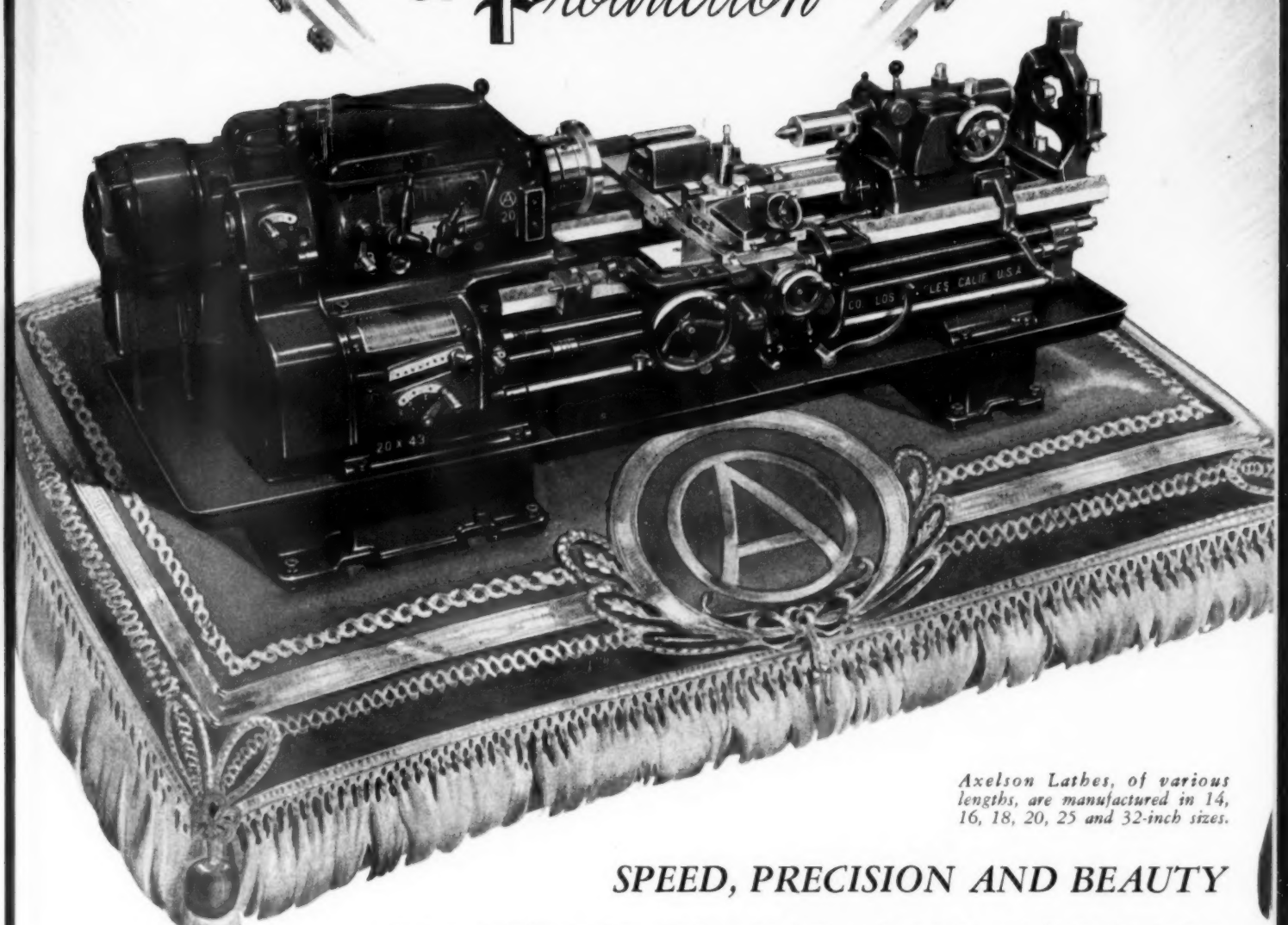
Crown Jewel of Production



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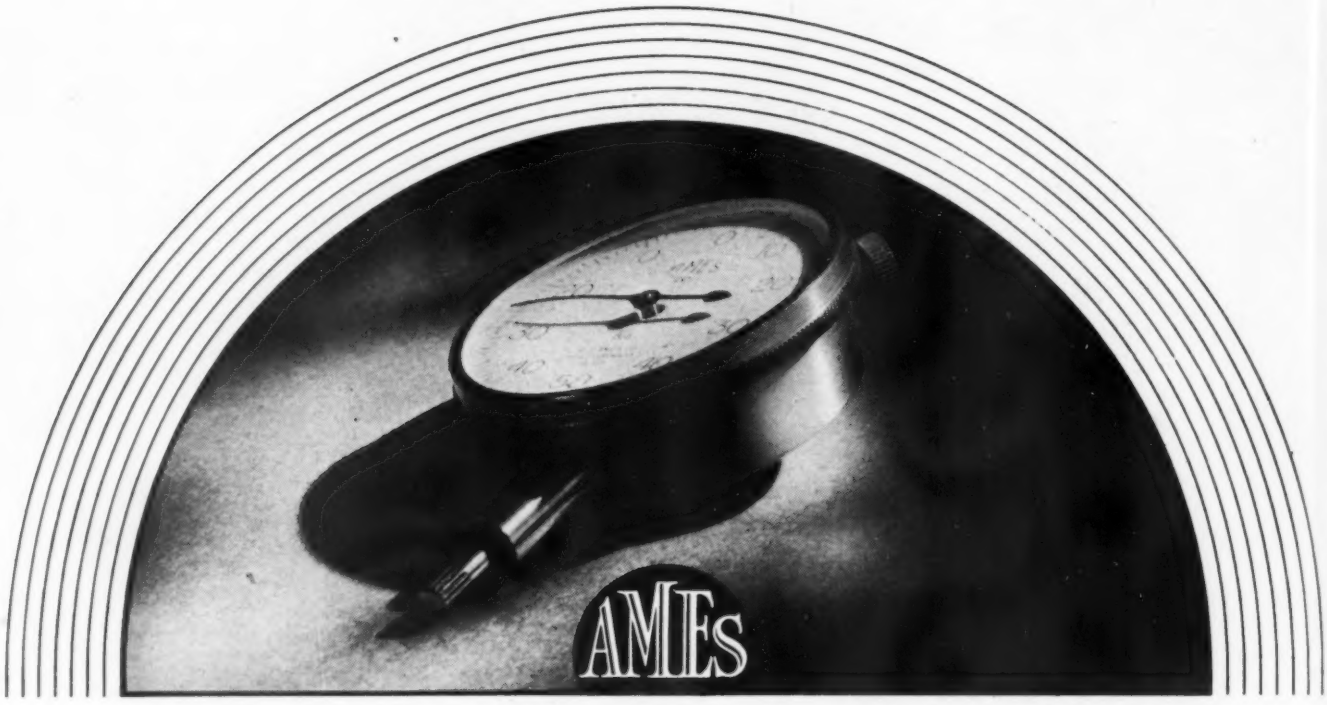

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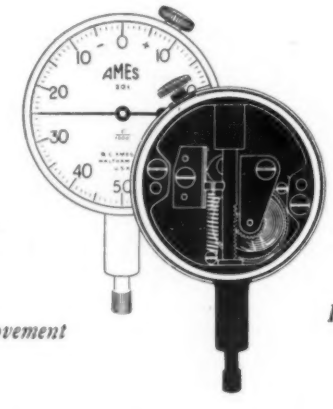

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Forged Wheel Supports

Hardened Steel Guidepin and Guide Block

Burnished Hardened Bearings

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FOOTE BROS.
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In the giant Pratt & Whitney engines that power such airliners as the Republic Rainbow, Foote Bros. "A-Q" Gears are used.

The world is witnessing revolution in aircraft design. Huge *airliners* span oceans in a matter of hours. *Jet propelled planes* fly at speeds approaching the velocity of sound. Mammoth *flying wings* offer a radical approach to transportation of the future. Radical too are the gears and power units developed to meet the demands of engineers willing to break with tradition.

The reason so many aircraft manufacturers call on Foote Bros. for gears and power units, is found in the experience of this company to do the almost impossible in power transmission.

If your problem is one requiring extremely high speeds, light weight, compact design or low noise level, the solution may be "A-Q" (aircraft quality) gears. If you require a unit to actuate linear or rotary motion—on an exact time cycle or within close limits—Foote Bros. can develop a Power Unit to meet your needs.

Our engineers will help you find the answer to any problem in gearing or power application.

A recently issued bulletin on Power Units giving complete engineering data on "packages of power," will be sent on request. Also available is a bulletin on Aircraft Quality Gears. Mail the coupon.

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. E, 4545 S. Western Boulevard
Chicago 9, Illinois

Please send me Bulletins on:
☐ Power Units ☐ Aircraft Quality Gears

Name.....*Position*.....
Firm.....
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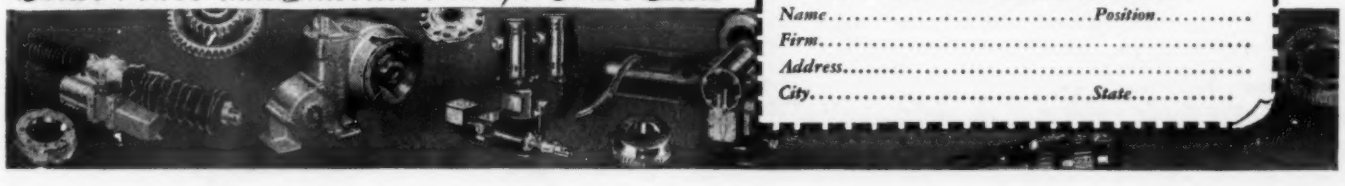

THE ART OF ACCURACY

QUAKER CITY CRAFTSMEN, USING THE MOST MODERN MACHINES PRODUCE PRECISION GROUND FORM WORMS . . . OUR RIGID STANDARDS ARE NOW MEETING EXACTING DEMANDS OF THE ELECTRONICS INDUSTRY . . . YOUR INQUIRY WILL BE APPRECIATED AND WILL BE GIVEN PROMPT ATTENTION.

1910 NORTH FRONT ST.
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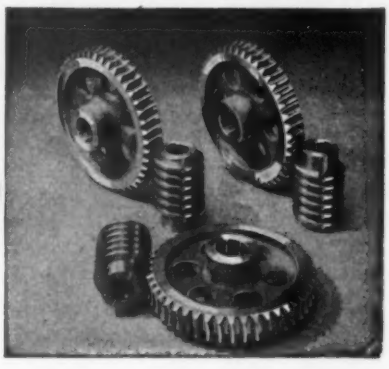
QUAKER CITY GEAR WORKS, INC.

When the worm turns



let it be

STAHL

For worms or gears of all kinds —get your estimate from Stahl, because we cut them all—in any quantity—of any material.

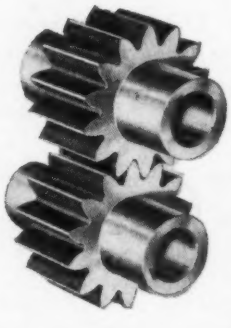
With our modern facilities geared to every detail of gear production, we can meet your most exacting specifications — promptly — effectively — economically.

Tell us your needs and ask us to tell you how we can meet them. Our quotations will interest you.

THE STAHL GEAR & MACHINE CO.
3901 Hamilton Ave. Cleveland, Ohio

Built-in Quality

MAKES THE EXTRA VALUE IN CINCINNATI GEARS!



Control with precise accuracy is the answer to Longer Gear Life.

Rigid inspections before and after each operation . . . constant tool check . . . accurate material control . . . plus personnel know-how, make possible the enviable Gear Life Records of Cincinnati Gears, Good Gears Only.

First choice of industry for more than forty years.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

In the race for faster production at less cost, Ohio Stock Gears offer every engineer 3 big advantages:

1. They are more readily obtainable than special gears.
2. Their lower costs reduce production costs.
3. They cut replacement time and costs.

And . . . Ohio Stock Gears are thoroughly accurate in every detail of tooth, pitch, face, bore and tolerance.

Plan these profitable factors into your machines. Join the hundreds of nationally known concerns whose engineers have proved the value of Ohio Stock Gears. Check on your needs now.

THE OHIO GEAR COMPANY
1326 EAST 179th ST. • CLEVELAND 10, OHIO

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SPECIALISTS IN THE MANUFACTURE OF

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For Smoother, Quieter Operation In Applications Where Straight Bevel Gears Are Conventionally Used

MADE FROM ALL MATERIALS *Exactly* TO YOUR SPECIFICATIONS

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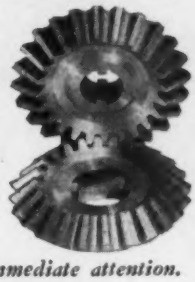
GEARS
For INDUSTRY

Since 1888 . . .

We have been making many types and sizes of gears for industry. Vast plant facilities of the most modern gear cutting equipment assure capable handling of your *production* or *special* gear requirements.



HELICAL GEARS—Made from 1" to 60" in diameter and from 24 DP to 1½ DP.
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MACHINE CUT RACKS—Cut in any length with teeth of 24 DP to 1 DP.

Your gear inquiries will receive immediate attention.

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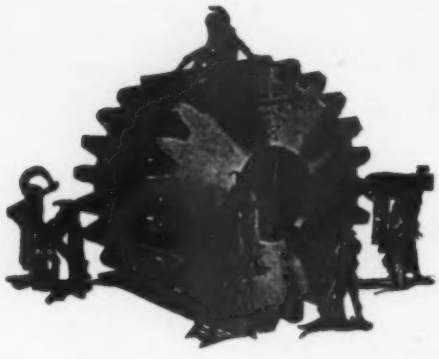
MANUFACTURING COMPANY
1140 W. MONROE STREET · CHICAGO, ILL.



GANSCHOW

CUT GEARS MEMBER OF AGMA **ALL TYPES**

Better Gear Products

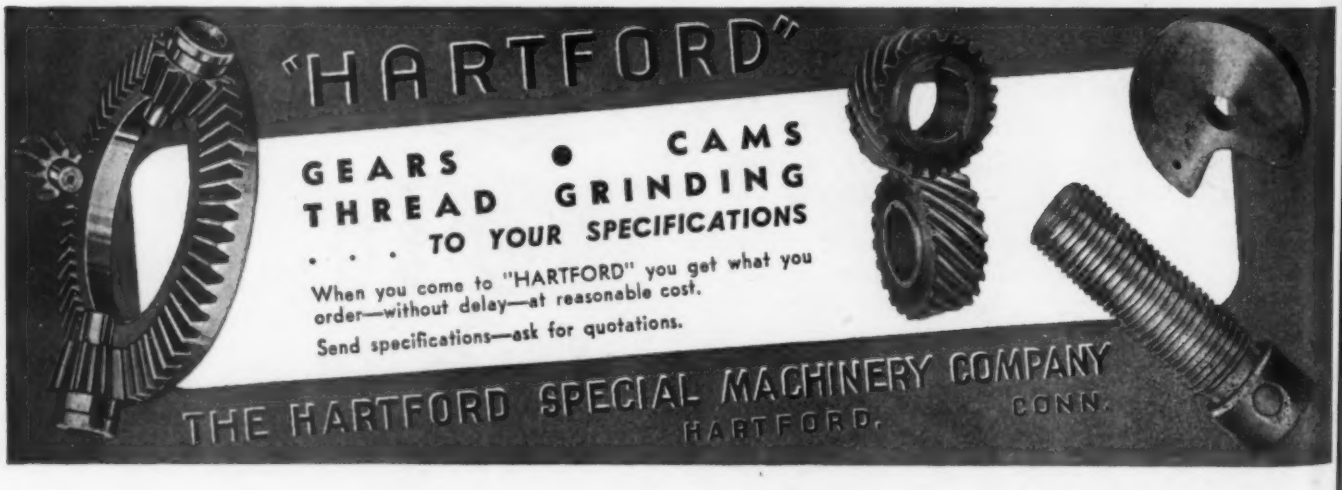
GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.

"HARTFORD"

GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS

When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.

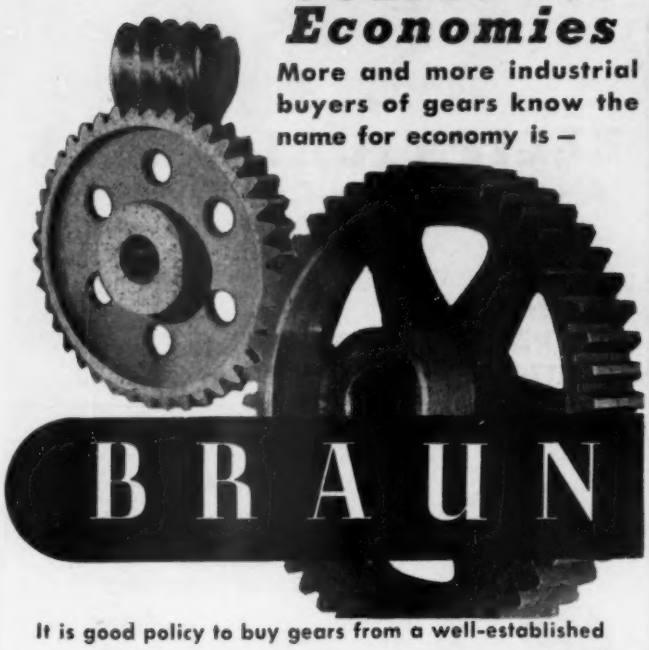
Send specifications—ask for quotations.



THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONN.

Geared for Economies

More and more industrial buyers of gears know the name for economy is —



BRAUN

It is good policy to buy gears from a well-established organization with a modern completely equipped factory. Braun has the facilities and experience of 38 years in manufacturing large orders of gears. Send your prints to Braun for estimates without obligation.

BRAUN GEAR COMPANY
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GEARS

to Customer's Specifications

• Our experience and facilities assure uniformity and accuracy. Our engineering service is available for consultation.

The ADAMS Company DUBUQUE, IOWA — ESTABLISHED 1883

GEARS *by Fairfield*

—A PLUS VALUE *in any product!*

If gears are a component part of the product you sell, there is no finer recommendation for the QUALITY of your product than to be able to say that it is EQUIPPED WITH "FAIRFIELD GEARS." Long producers of the gears needed in high grade trucks and tractors, Fairfield now brings the same standards for gear performance to a wide variety of products.

Get acquainted with Fairfield's engineering and production facilities. Your inquiry will receive prompt attention.

typical products

Fairfield gears are used in all of these classes of equipment . . .

Road Rollers . . . Trucks . . . Sweepers . . . Tractors . . . Power Shovels . . . Printing Presses . . . Aircraft Engines . . . Lathes . . . Grain Combines . . . Mine Hoists . . . Drilling Rigs . . . Rail Cars . . . Diesel Engines . . . Steam Engines . . . Marine Winches.

FAIRFIELD

for FINE GEARS

MANUFACTURING CO.
01 South Earl Avenue
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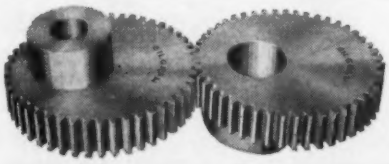
A HANDFUL OF PRECISION that gives a WORLD OF PERFORMANCE

Remarkably compact, yet what a job Tuthill Model L Pumps do in pressure lubrication and hydraulic service! These mechanically sealed, internal-gear rotary pumps are built in capacities up to 3 g.p.m. Pressures up to 400 p.s.i. Ring or foot mounting. Many porting arrangements.

Write for Model L Small Pump bulletin

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

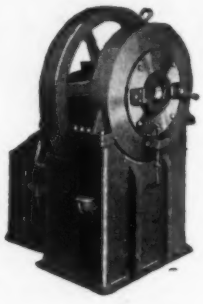


ELLIPTICAL GEARS
Also Other Non-Circular Gears

BILGRAM TRADE MARK

ALL TYPES OF GEARS

BILGRAM GEAR & MACHINE WORKS
1217-23 Spring Garden, Philadelphia, Pa.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

YOUR REQUIREMENTS
assured by
Our 69-Year Experience

Grant "know-how" in making and supplying gears is at your service. Whether you require a single "special" or stock gears in quantity, it will be to your advantage to submit your requirements to "Grant" for quotation and delivery date. We are in position to render prompt service.

GRANT GEAR WORKS
BOSTON, MASS.
ESTABLISHED 1877

GEARS TO ORDER

Spiral and helical gears; special couplings, bushings and collars; pins, pulleys and rollers. Made to your specifications—*promptly*.

KELLEY GEAR & TOOL CO.
Bristol, Tennessee

QUALITY GEARS CUT TO ORDER

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

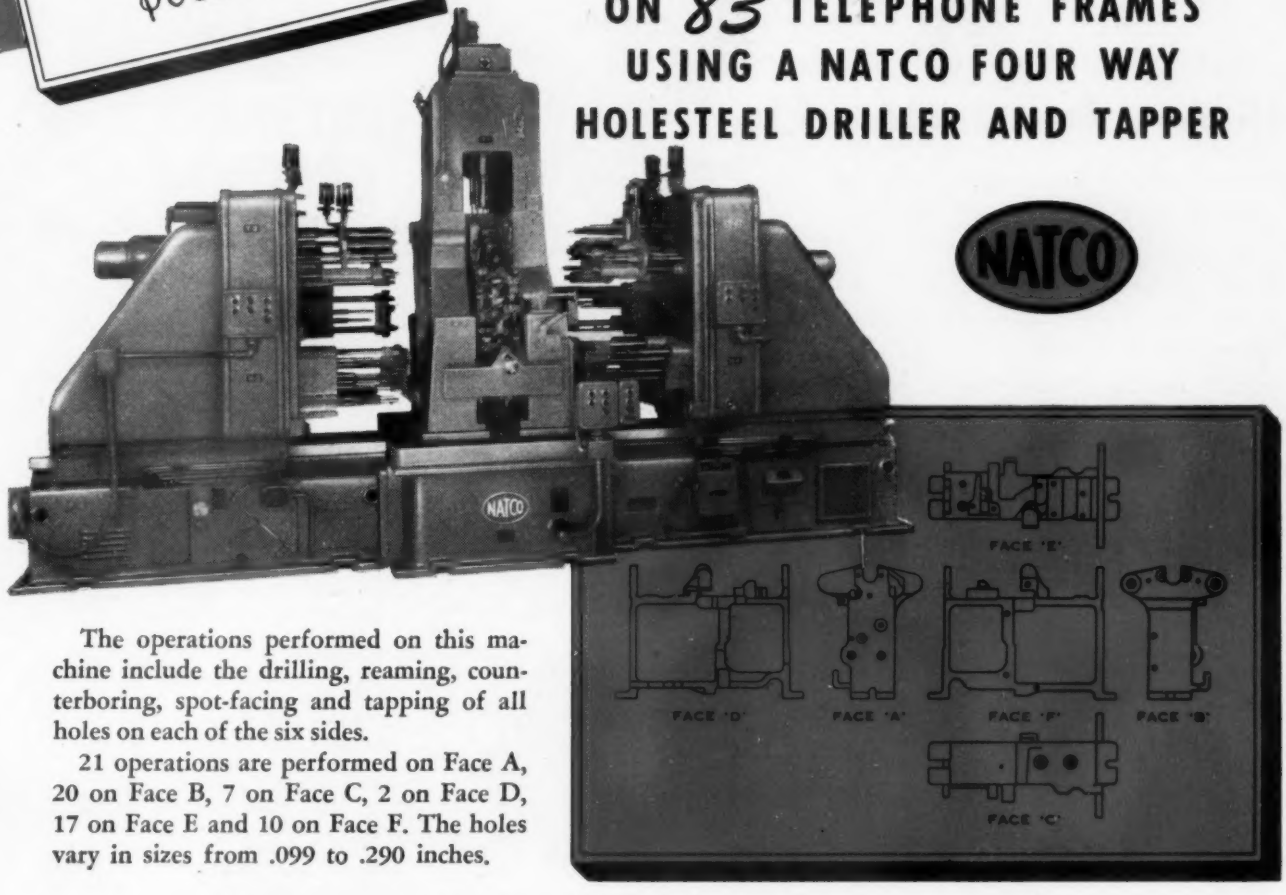
MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

Drill 3071
Ream 332
Spotface 498
C'Bore 249
Tap 2241
Total 6391

a total of 6391 Operations every hour

ON 83 TELEPHONE FRAMES USING A NATCO FOUR WAY HOLESTEEL DRILLER AND TAPPER

NATCO



The operations performed on this machine include the drilling, reaming, counterboring, spot-facing and tapping of all holes on each of the six sides.

21 operations are performed on Face A, 20 on Face B, 7 on Face C, 2 on Face D, 17 on Face E and 10 on Face F. The holes vary in sizes from .099 to .290 inches.

NATCO SOLVES YOUR "HOLE" PROBLEMS

NATCO Way Type Machines are engineered to perform a multiplicity of operations on parts varying from small castings to extremely large and heavy parts. These machines, whether for small, medium, or large parts, are designed to reduce operator fatigue, lessen scrap through the maintenance of required tolerances and lower costs per hole by being engineered for the job.

If you are experiencing problems in your drilling or tapping departments they are needless worries. Call or write *our* nearest Office, present your problems and rest assured that with a NATCO you can again depend on required production in your drilling and tapping departments.

Let NATCO solve your Hole problems with a machine engineered to your production requirements.

National Automatic Tool Company, Inc., Richmond, Ind.

MULTIPLE DRILLING, BORING, AND TAPPING MACHINES

INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1809 ENGINEERING BUILDING, CHICAGO; 409 NEW CENTER BUILDING, DETROIT; 1867 ELMWOOD AVENUE, BUFFALO; 2998 COMMERCE BUILDING, NEW YORK CITY

"ALLMETAL" CUTTING TOOLS

For All Metal Cutting Jobs

Standard tools of all grades . . . General Purpose, Cast Alloy, and Tungsten Carbide. Three of a kind when it comes to quality, a Delloy tool, bit, or tip will do the job better and faster. Delloy tools hold their edges longer, thereby increasing the number of pieces produced by cutting the down-time. Prove it today by sending for samples of the size and type of cutting tool you are now using.

If you can't tolerate the tolerances you are getting . . . if you have a problem in turning, boring, planing, or facing, don't let idle machines and men fatten your overhead . . . talk over *your* problem with Delloy. Delloy's skilled staff of tool designers and metallurgists will produce the best and proper grade of tool for your particular job. Send a blueprint, sketch, or sample. Our complete grinding department assures quick delivery on special tools. Standard tools stocked for immediate delivery.

Delloy
METAL CORPORATION

CUTTING TOOLS

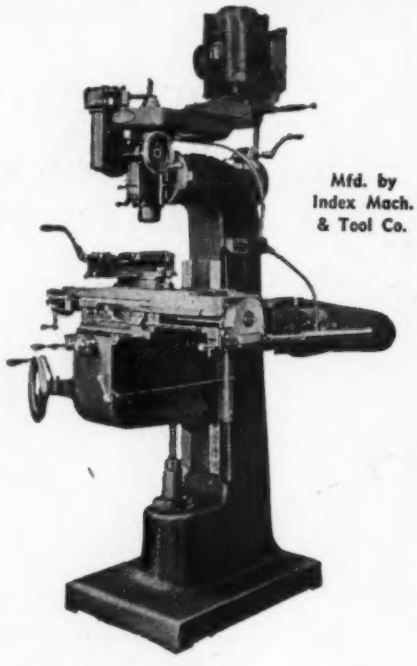
Affiliate of Ace Manufacturing Corporation

1203 East Erie Ave., Philadelphia 24, Pa.

Sales Representatives in all Principal Cities

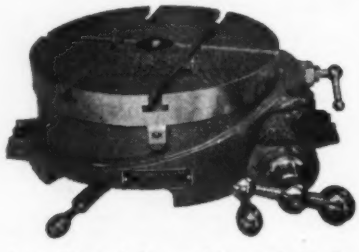
INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. ***Literature promptly mailed on request.***



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table



A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

The Lyon

INTERNAL GROOVING TOOL

Its versatility saves costly preparation time—provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time—and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

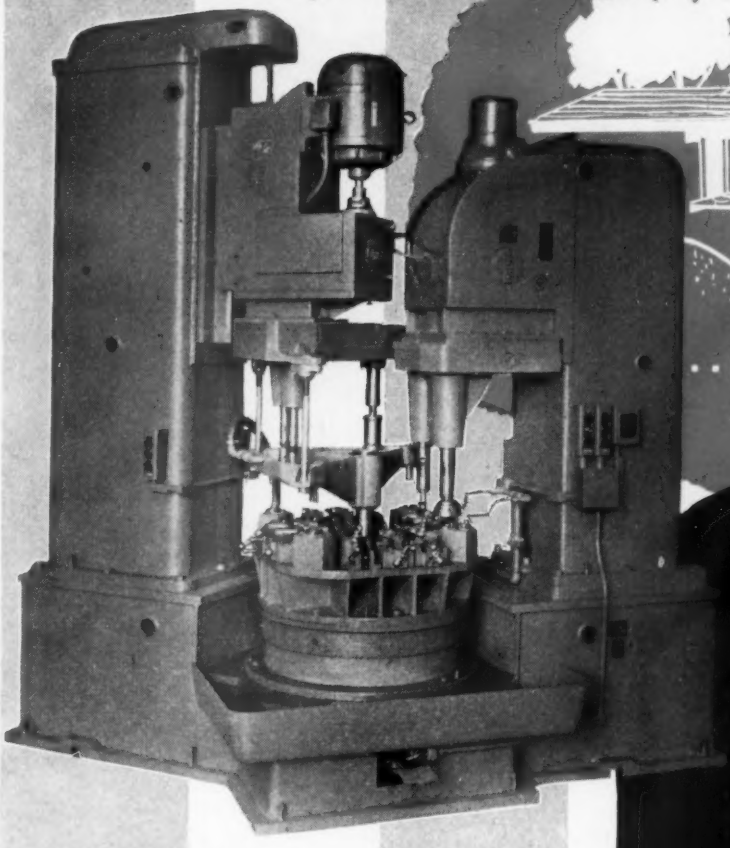
By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO.,
WORCESTER 3, MASS.

Background for life...

...IN A MODERN HOME



Baush Vertical Dual Unit—
Has cam-action unit with 3 spindle head on left—Tapping Unit with 2 spindle head on right. 34" rotating table is manually operated and has 4 index stations on which fixtures with shed-roof design for chip disposal are mounted.

Bushing plate hangs from head of cam unit, with center locating post, and rests and registers on holding units. Plate contains guide bushings for all tools except taps and dies. Tooling consists of inserting blade cutters and adjustable blades for threading and tapping. Each of 4 stations loads and unloads 3 parts. Operations sequence: Drill — Ream and Counterbore — Back Countersink — Thread and Tap.

Production at 85% efficiency: 68 each of 3 parts per hour
100% efficiency: 80 per hour.

There's no limit to tomorrow's home market . . . because there's no limit to home convenience wants . . . and no limits to fulfilling those wants. That's where Baush — with special-purpose machinery — comes in, to speed economical production for today's and tomorrow's BIG market for modern home equipment.

This Baush Vertical Dual Unit Machine drills, reams, counterbores, back countersinks, threads and taps — in one multiple operation — the drain fittings, couplings and stop rings for one of today's leading manufacturers of electric garbage disposal units for modern kitchens.

Baush Engineers are ready to work with you on your problems. Phone, wire or write us today.

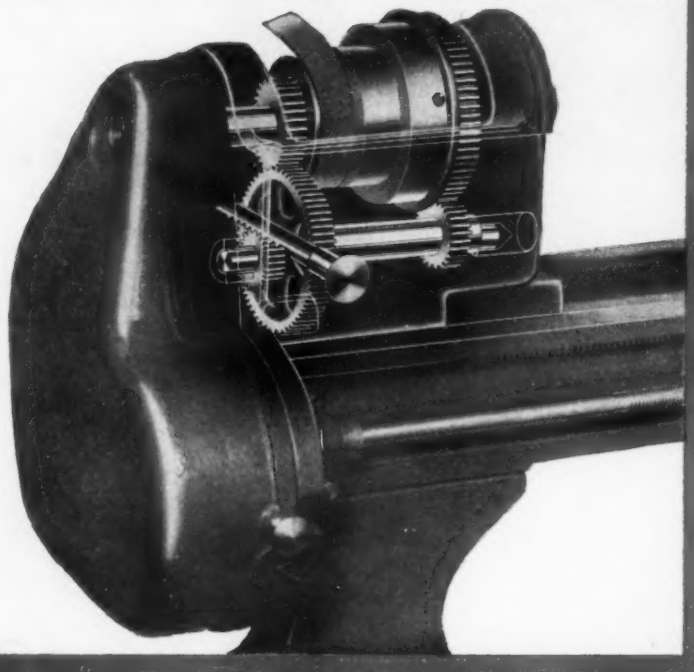
BAUSH

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS

Logan A NAME TO REMEMBER WHEN YOU THINK OF **BETTER** LATHES

Finger Tip Control for Safety, Ease and Speed in Shifting Back Gears



BACK GEARS ENCLOSED IN HEADSTOCK

PLUS PATENTED SHIFTER RACK INCREASES SAFETY AND EFFICIENCY, ADDS TO APPEARANCE OF LOGAN LATHES

Logan Quick Change Gear Turret Lathe

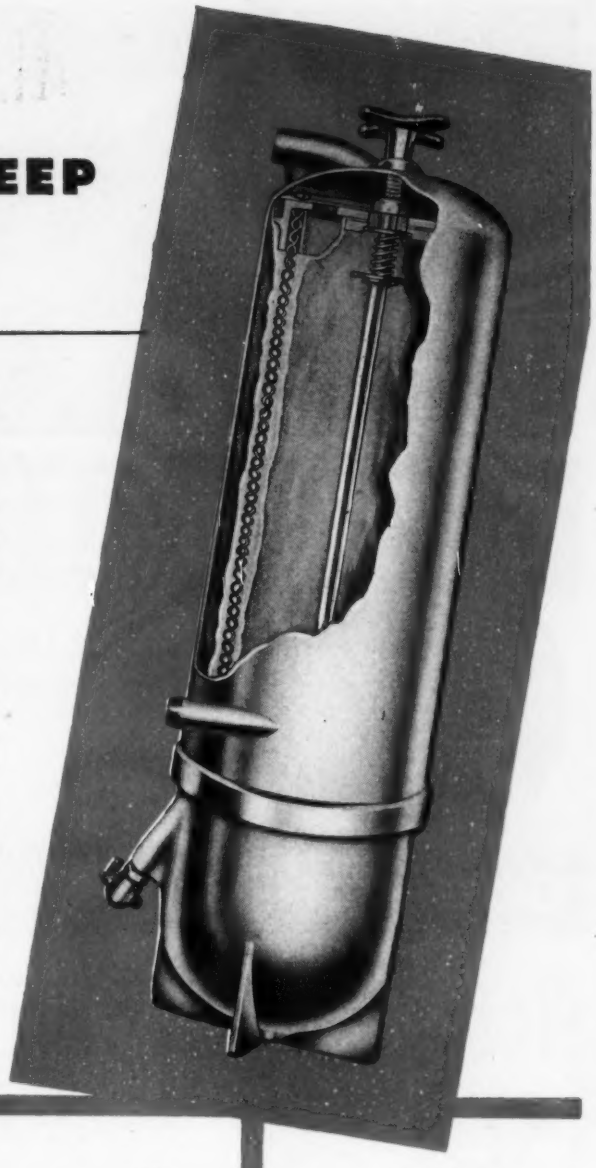
SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 10½" . . . . bed length, 43⅛" . . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 1½"—8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways and 2 flat ways.

Logan advanced design not only encloses back gears in the headstock, it also places the complete control of these gears at the operator's finger tips. In the above illustration, note how the patented Logan Shifter Rack is located on the front side of the headstock. That means there is no need to reach over the headstock, or to lean forward close to the work or moving parts in order to pull a lever that shifts power to or from the back gears. Thus, the operator not only avoids risk of injury, he also makes the shift more easily and quickly. In addition, this location of the shifter rack adds to the trim, clean cut appearance of Logan Lathes. It is another example of the practical engineering which is combined with careful construction and quality materials to make Logan "a name to remember when you think of *better* lathes." For full information, see your nearby Logan Lathe dealer, or write direct for a catalog.

L-1

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

THE *NEW*, EASY, LOW-COST WAY TO KEEP COOLANT *CLEAN*



Now you can put a coolant filter on each grinding machine . . . and gain the advantage of *flexibility* . . . at an average cost of only a few cents a week.

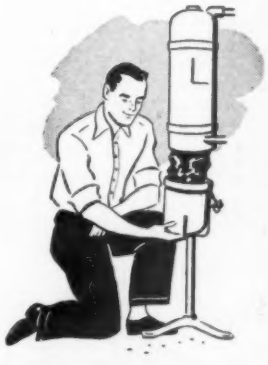
Cuno's new COOLANT-KLEAN is priced less than any comparable filter. The element needs replacement less often . . . new bags are inexpensive . . . coolant stays cleaner longer. Construction is simple and compact.

Typical reports from users say . . . *more dirt collected . . . up to 6 weeks without replacing element . . . "pick-ups" eliminated . . . bags replaced in less than 5 minutes.* (The illustrations show how easy it is to replace the bag.)

COOLANT-KLEAN can be used on any grinder and almost any other machine using coolant or cutting oil . . . is installed quickly, without extra pump, electrical work, plumbing or by-pass. Handles full flow. No filter aid needed. No pre-coating.

Now that unit filtration no longer means high cost, large size and expensive maintenance . . . adopt this more efficient method of cleaning coolant. Send the coupon for COOLANT-KLEAN bulletin.

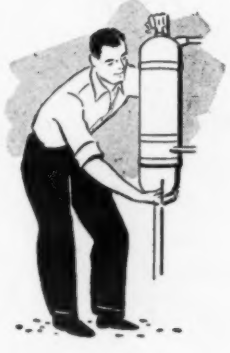
The Easiest Way to Clean a Filter



Single screw clamp at top loosens sump

Grit emptied from sump

New bag easily slipped over spacer screen



Sump replaced

KEEP FLOW ON "GO" WITH

CUNO

ENGINEERED FILTRATION

Free Bulletin on "Finer Finishes at Less Cost"

CUNO ENGINEERING CORPORATION, 244 South Vine St., Meriden, Connecticut

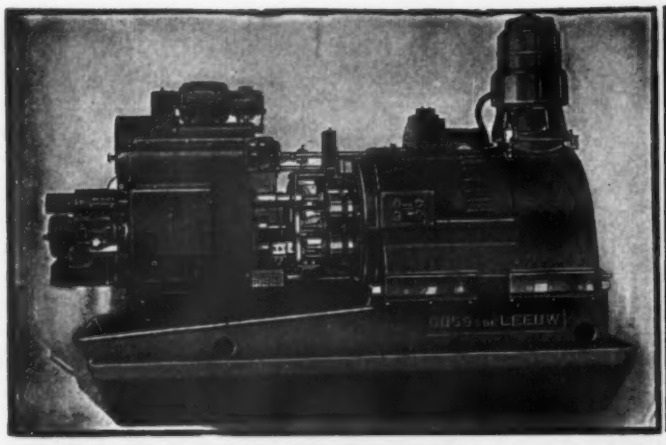
Gentlemen: Send Bulletin on new COOLANT-KLEAN filter to

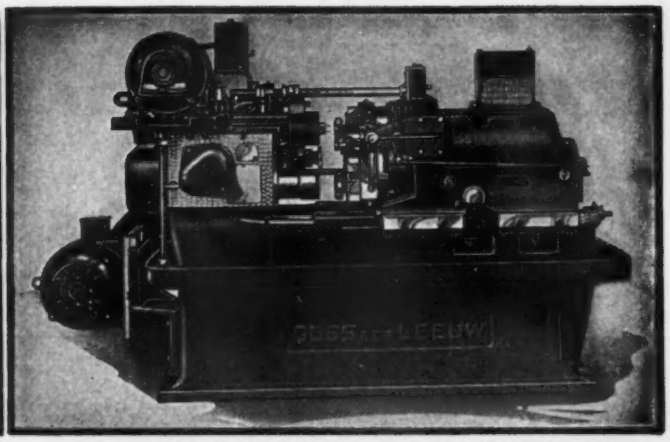
Name.....

Company.....

Address.....

Position.....





GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
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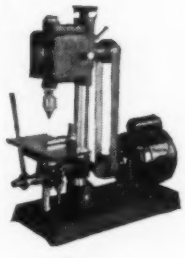
Sensitive TAPPING

THE Hamilton Sensitive Tapping Machine is the sensible tool to install for the specialized tapping of tiny holes. It literally feels its way into center position while idling in reverse, and shifts its direction of rotation instantly and automatically when pressure is applied to the feeding lever. Release of pressure instantly reverses direction again and the tap is safely and speedily withdrawn. Blind holes may be threaded to the very bottom without danger of tap breakage.



Within its capacity (0 to 10-32 hole diameter) this machine will take all of the abuse that intensive production can inflict . . . and your work will still be accurate!

Write for illustrated literature containing specifications and prices. Do it now! You'll be glad you did. Address Department D.

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SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
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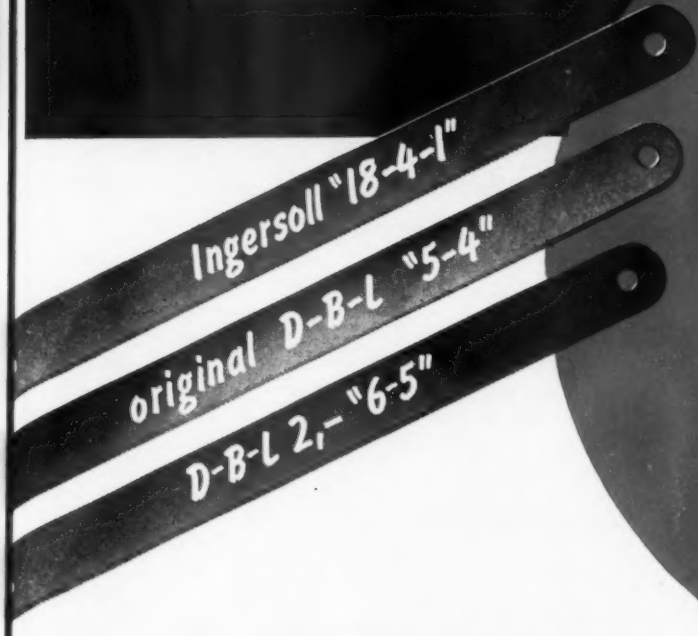
These Steels take the "HACK" OUT OF HACK SAW BLADES



When you order hack saw blades from your regular supplier, make it a rule to specify blades made of "Ingersoll 18-4-1" or of "Ingersoll D-B-L." Both are steels that really take the "hack" out of hack saw blades. That's why blades made of these Ingersoll steels are being used today in so many shops and plants all over America.

Ingersoll "18-4-1" Steel is again available to blade makers. Where "D-B-L Blades" are preferred, remember only Ingersoll has had a 6-year record in the successful production of this steel which insures blades with tough cutting edges, high impact resistance and relative freedom from decarburization.

INGERSOLL "18-4-1"

INGERSOLL D-B-L*

INGERSOLL *Steel Division*

Borg-Warner Corporation • New Castle, Indiana

Plants: New Castle, Indiana • Chicago, Illinois • Kalamazoo, Michigan

*Furnished in the original D-B-L Regular, -"5-4" and D-B-L 2, -"6-5".

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IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

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THE TURRET LATHE *Your Operator* APPROVES!

EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

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For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor. 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

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No. 3 Universal, 1½" capacity
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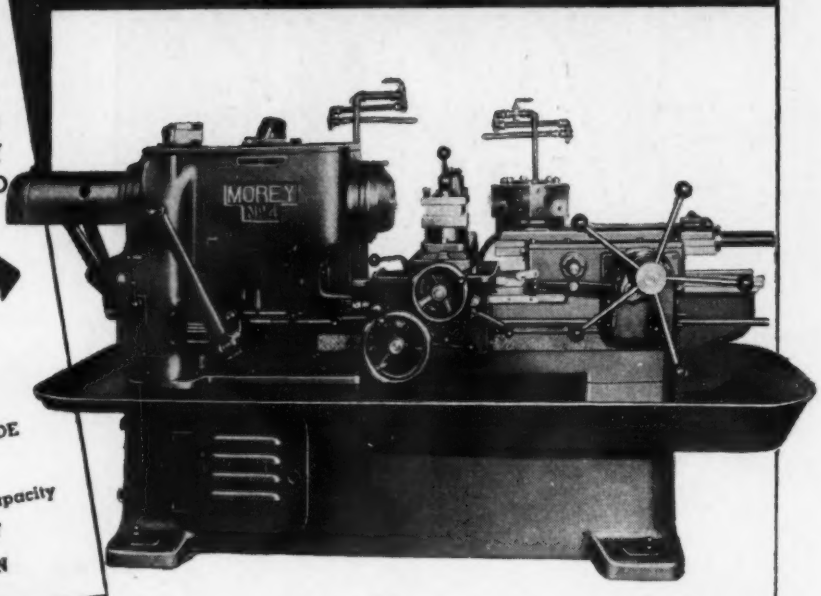

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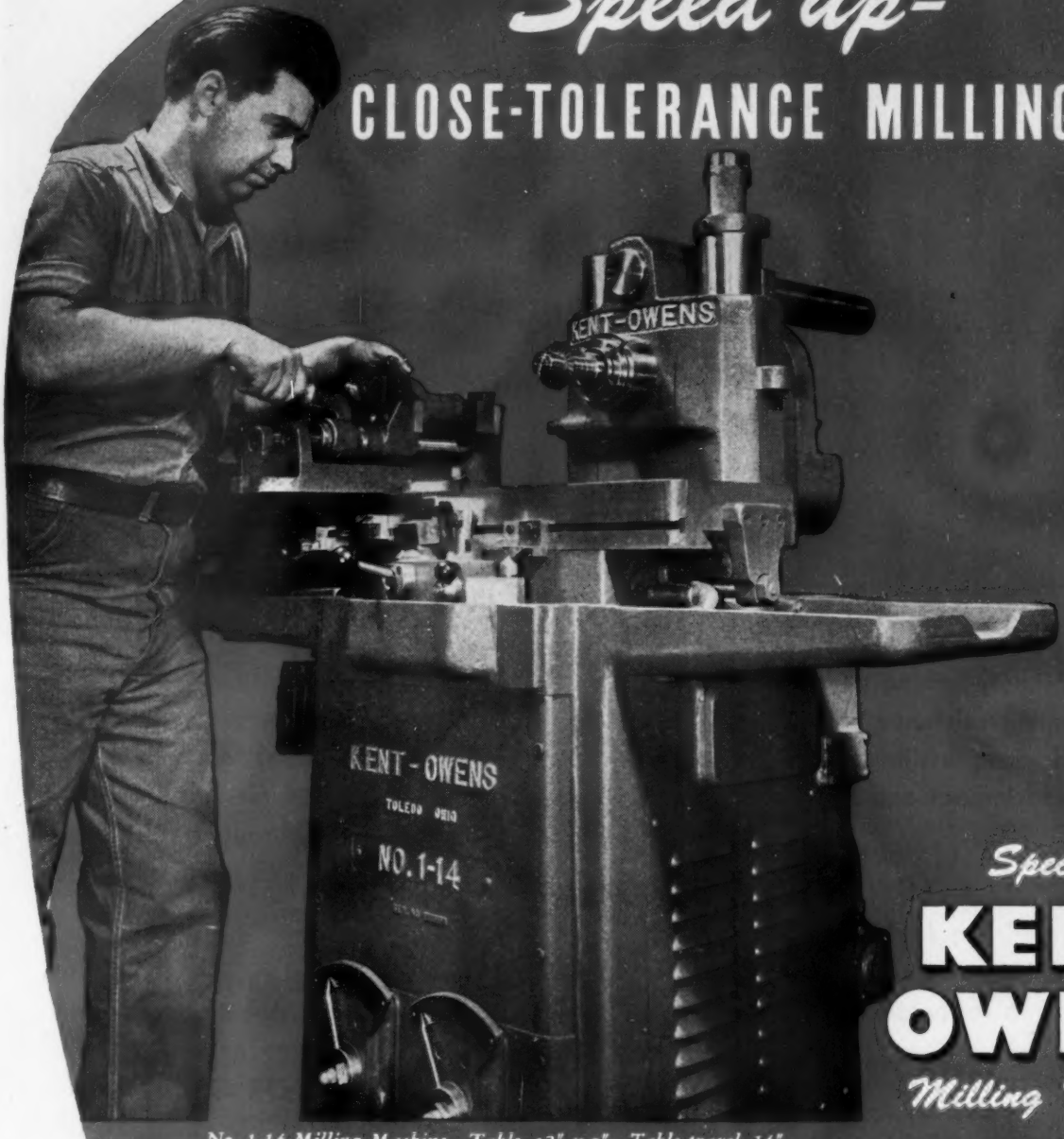

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No. 1-14 Milling Machine—Table, 32" x 9"—Table travel, 14"

Kent-Owens Machines welcome tough assignments in milling! They're adaptable to a wide range of work-problems . . . performing with utmost accuracy, speed and dependability. Operators find the going "smooth and easy" with Kent-Owens Millers. Ruggedly built . . . with practical features for simple and efficient operation. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

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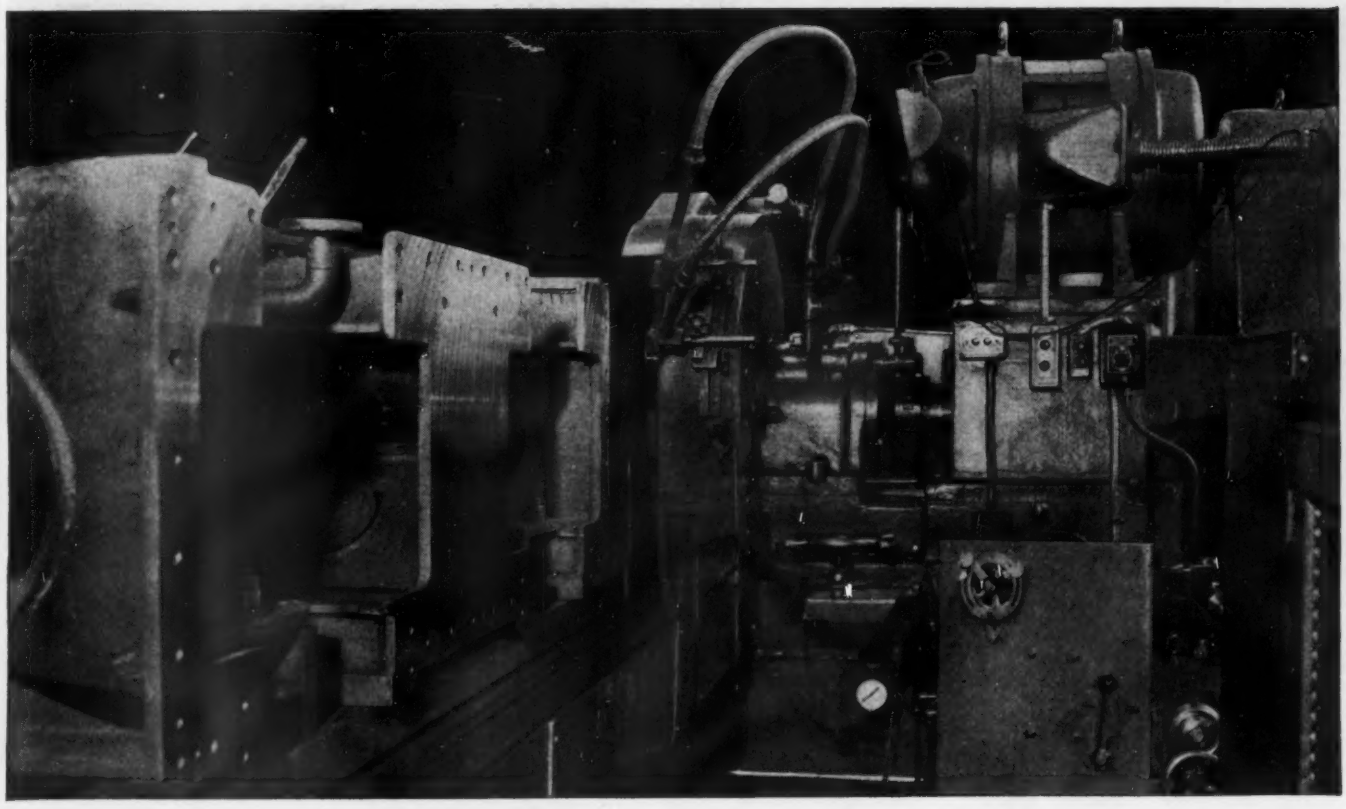
"FORGINGS TO EVERY SPECIFICATION"



"Bridgeport" Does a Precision Job in Heroic Dimensions!

These were cast steel casings for a gigantic marine speed reduction unit. The job was to finish-grind the flange faces ready for assembling. The joints had to be oil-tight, and remain so under extreme vibration. No compromise!

It was done in one operation on a "Bridgeport" Face Grinder to .005 tolerance, two sides, in about 1½ hours . . . a sweeping reduction in the time it would have taken by any other metal-removing method. The famous "Bridgeport" Sectional Grinding Wheel—composed of individual abrasive units locked in a steel chuck—was used, to insure cool, clean, grit-free cutting.

This is but one of innumerable instances where "Bridgeport" face grinding has excelled in producing flat surfaces. For example, a cast iron turret 28"x24½" was formerly machined at a cost of $2.10. When it was placed on a "Bridgeport" Face Grinder, the cost dropped to 37¢ . . . an 82½% saving and a better, more accurate finish!

"Bridgeport" has a complete line of face grinders in table sizes up to 210" x 54" and wheels up to 60" diameter. If you have a metal-removing problem, we may be able to solve it. Write us the details.

BUXITE—*the new abrasive*

A new "case hardening" process for all types of abrasive wheels. Grinds carbide and cast alloy cutting tools at substantially lower cost. Less heat, finer finish, no "loading." If you grind superhard tools and materials, ask for the story of "BuXite."

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport

GRINDERS • GRINDING WHEELS • BUFFING LATHES

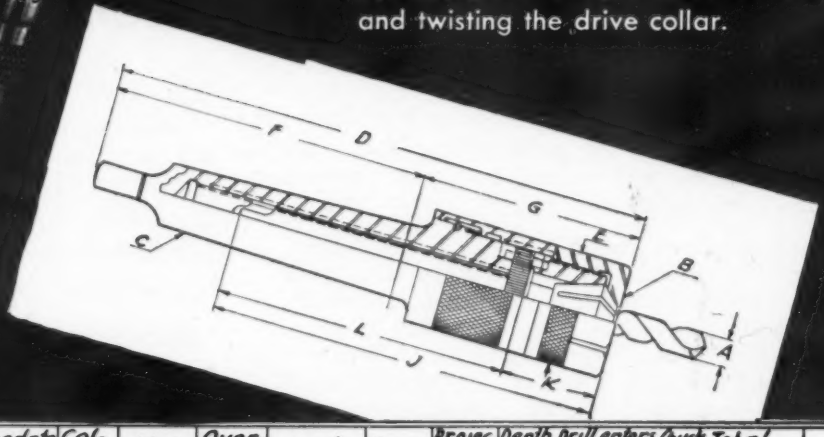
The "LONG and SHORT" of It

Scully "Feed as you Need" Chucks

WITH Scully "Feed as you Need" Chucks, you can chuck short or long series drills with only a small portion of the drill extending—thus keeping overhang at a minimum. The drill always has a positive backing against slipping into the chuck.

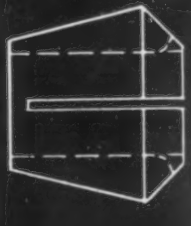
You need only half as many drills when you use Long-Series Drills for Short-Series work. The saving in Time and Tools is apparent.

The drill is adjusted for depth or overhang without releasing the chuck, by simply loosening the Collet lock nut and twisting the drive collar.



Tool Number	To Accommodate Inclusive Drill sizes	Collet No	M.T. Shank	Over-all length	Body Diameter	Shank Depth	Projection from Spindle	Depth Drill enters Chuck when completely Drawn in	Depth Drill enters Chuck when completely Extended	Total Adjustment	Price Each
	A	B	C	D	E	F	G	J	K	L	$
NA-1	57 To 11/64	A	1	4 1/4	7/8	2 7/16	1 13/16	2 11/16	13/16	1 7/8	19.94
NB-2	1/8 " 9/32	B	2	5	1 1/16	2 15/16	2 1/16	3 3/8	7/8	2 1/2	24.63
NC-3	3/16 " 13/32	C	3	6 9/16	1 1/2	3 11/16	2 7/8	4 7/16	1 5/16	3 1/8	30.50
ND-4	5/16 " 9/16	D	4	7 15/16	1 7/8	4 5/8	3 5/16	5 1/2	1 5/8	3 7/8	38.71

FURTHER INFORMATION AND QUOTATIONS ON REQUEST



Collet Number	For Drill Sizes	Price Each
A	57 TO 11/64	$2.64
B	1/8 " 9/32	3.52
C	3/16 " 13/32	5.28
D	5/16 " 9/16	7.04

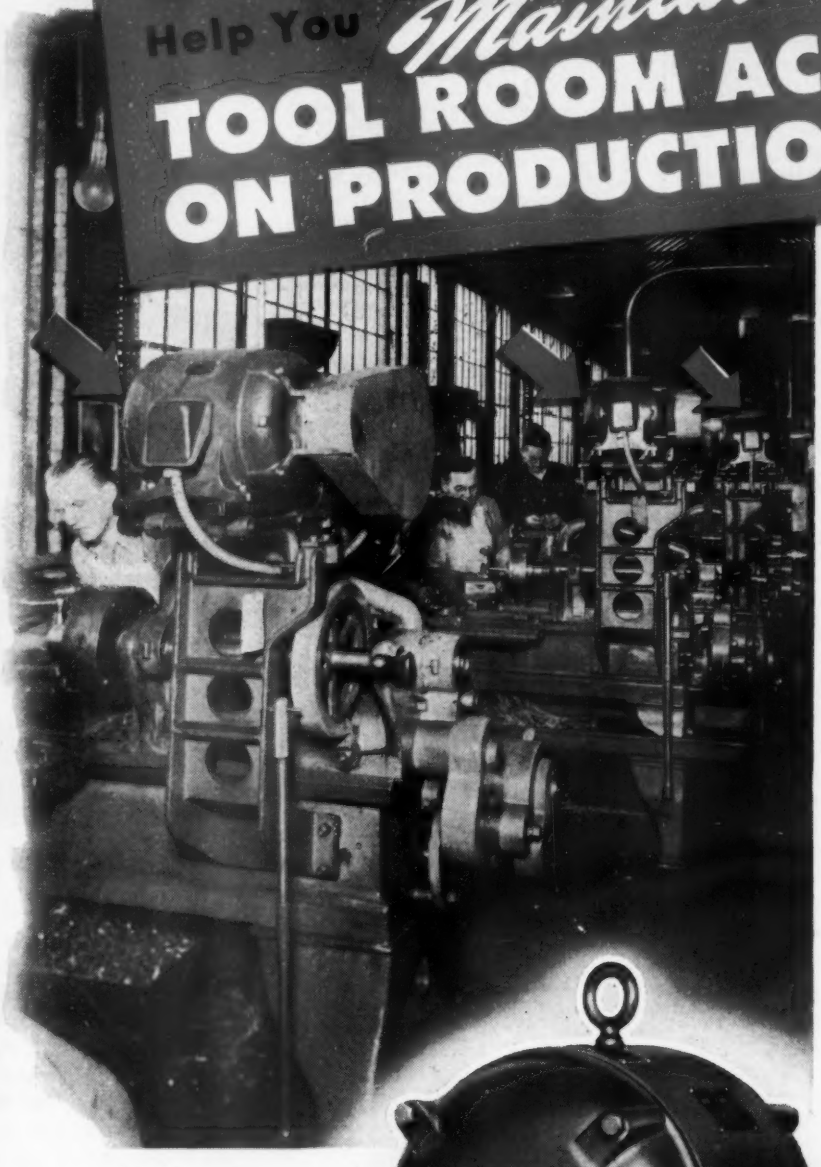
Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1902 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.

CENTURY MOTORS

Remarkable Freedom From Vibration Will Help You *Maintain* TOOL ROOM ACCURACY ON PRODUCTION JOBS



3 Century Type S C Squirrel Cage, 3-phase motors

On machine tools of high precision, a Century Motor will help maintain the close tolerances for which the machine was designed. Century motors' smooth operation, with a minimum of vibration means that the driven equipment turns out more accurate production.

Rigid construction, accurately machined feet, permanent alignment, and many other Century features assure top performance during a long motor life, under the toughest operating conditions.

Century motors are built in a wide range of types, in sizes from 1/6 to 400 horsepower to meet the needs of practically every electric power application. They are furnished with open, protected, splashproof, explosion proof or totally enclosed fan cooled frames to meet the requirements of any surrounding atmosphere.

Specify Century motors on all your electrically powered equipment. They are engineered to the functional characteristics of the job to assure top performance.

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It's wise to CONVEYORIZE

SEND FOR YOUR FREE CATALOG

This catalog contains information about the construction features and uses of Rapid Wheel Gravity Conveyors, together with complete specifications and data on standard accessories manufactured for use with the conveyors. The catalog also shows on-the-spot photos of Rapid Wheel Gravity Conveyors in action on all types of conveying jobs.

Operating with the smooth gravity principle, Rapid Wheel Conveyors speed and ease the handling of goods wherever the need arises. Portable and easily handled, they may be set up or dismantled in a matter of minutes. They are manufactured in standard 5-foot and 10-foot lengths and in widths of 12" and 18". (Other lengths are manufactured upon request.)

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The Rapids-Standard Co., Inc.

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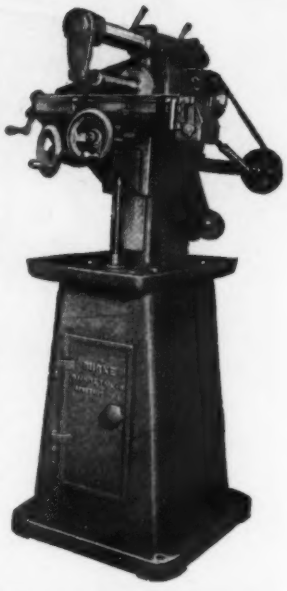
BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

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PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

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LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge Surrey, England

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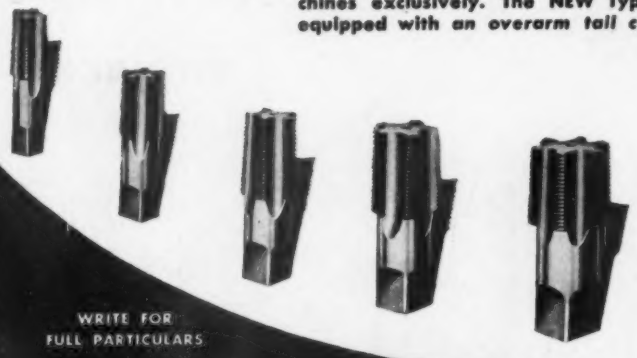
TOUGH Threading jobs licked by COULTER TYPE "H" THREAD TAP MILLING MACHINE

NOW . . . comes a development that extends the capacity of this 'wonder' machine. COULTERS' are made to perform the most delicate threading operation with both speed and accuracy . . . 40 years of specialized experience, manufacturing precision machines exclusively. The NEW Type "H" is equipped with *an overarm tail center and large collet chuck*, holding the work rigidly so *ONLY ONE REVOLUTION OF THE TAP* is necessary.

Any number of FLUTES, eccentric or concentric relief straight or taper can be produced. Pipe taps from ⅛" to 1½" and straight taps from ¼" to 1½"



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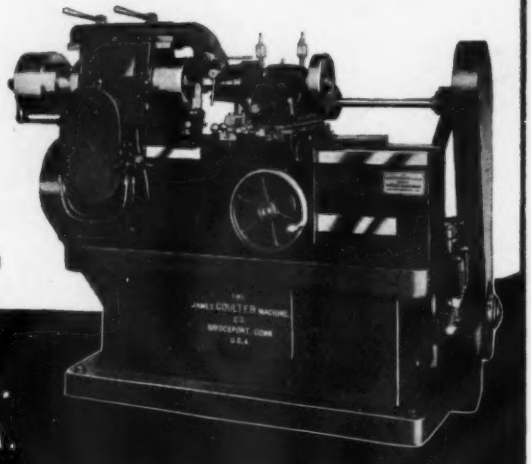

TYPE H

The James **COULTER** *Machine Co.*

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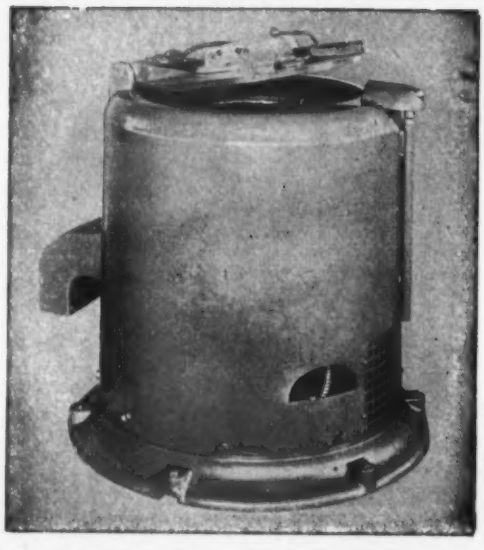
DRY SMALL PARTS QUICKLY and ECONOMICALLY with BARRETT CYCLONE CENTRIFUGAL DRYERS



The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

• The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

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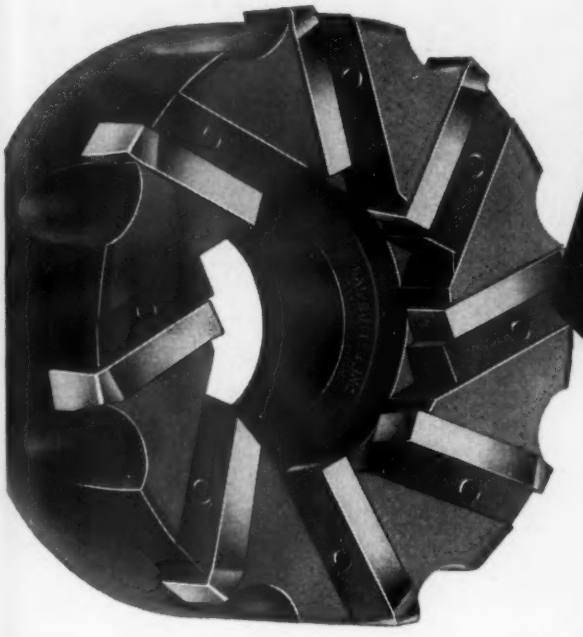


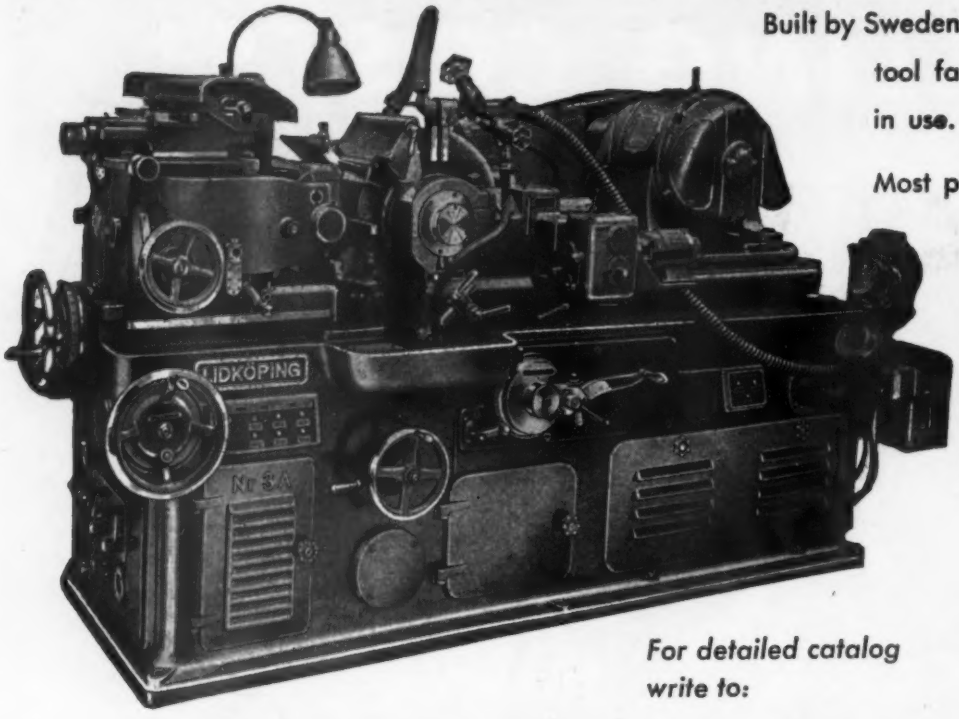
NEW Cal-Cutter SOLID CARBOLOY INSERTED BLADE MILLING CUTTERS

CHECK THESE FEATURES:

- FULL-BODIED INSERTED BLADES CUT GRINDING COST APPROXIMATELY 2/3
- IMPROVED CHIP CAVITY—FREE CUTTING CHIP CONTROL
- IMPROVED METHOD OF HOLDING WEDGES
- SMOOTHER OPERATION WITH EXTRA BLADES
- MILLS *ANY* MACHINABLE MATERIAL
- WEDGE AND BLADE DESIGN ELIMINATE SLIPPAGE
- HIGH GRADE ALLOY STEEL BODY
- INCREASED CUTTING AND IMPACT STRENGTH OF BODY AND BLADES

Now . . . chop dollars off milling costs with this new Cal-Cutter! You'll improve work quality, speed and cutter performance because of these new and exclusive Cal-Cutter features: Larger blade size . . . tests prove this reduces blade breakage and eliminates slippage. Grinding is simplified, too . . . the extreme precision of Cal-Cutter manufacture permits grinding blades separately on a surface grinder . . . reducing grinding time by approximately 2/3. Another Cal-Cutter development . . . locating the anchor wedge behind, instead of before the blade . . . that means a more efficient chip cavity—freer cutting because chip control cavity guides chips away from the work—better quality work. A wider range of rake angles may be ground, so that the cutter (with proper quality Carboloy blades) will mill any machinable material. Two extra blades reduce chatter and greatly lengthen tool life. Get this new cutter from your Cal-Cutter distributor *now* . . . and *save!*

SWEDISH LIDKÖPING CENTERLESS GRINDERS



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Most powerful.

Many sizes available for grinding pieces up to 14" diameter, 23" long; for grinding bars up to 6" diameter and 25 ft. long.

Large variety of attachments for:

Through-Feed
In-Feed
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Taper and
Shoulder Grinding

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Another Outstanding Cylindrical Grinding Job By

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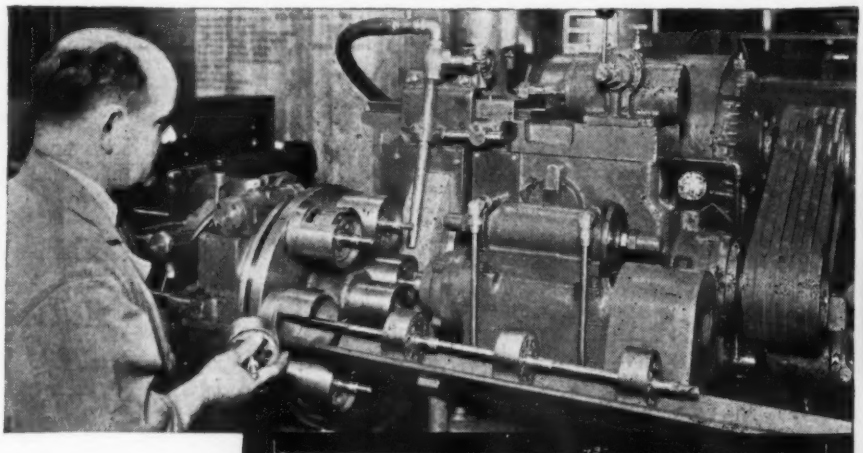
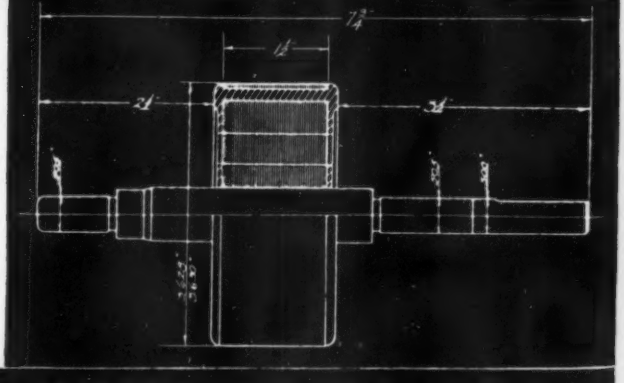




No. 135 Automatic Cylindrical Grinder

The grinding of the diameter of the laminations of an armature for a washing machine motor is one of the many jobs on which this machine is giving typical ARTER satisfaction. Production—200 pieces per hour. The central taper shaft diameter is ground before assembly with a production rate of 300 per hour.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

Take a look at what can't be seen

Margo Black, *J & H Associate*
Plant No. 4

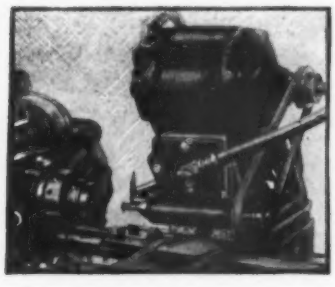
Even a flat wheel on a streamliner isn't as bad as an odd-sized ball in a ball bearing. That ball wears too fast, increases friction, leads to break-downs and needless cost. But no one could see or measure rapidly the fraction of an inch that would make that costly difference. So Jack & Heintz found a way. They developed an electronic ball sorter that separates balls automatically into 10 groups, the diameter of each group graded to an accuracy of *ten millionths of an inch* . . . and it does this *8 times as fast* as conventional equipment.

That's why Jack & Heintz ball bearings will last longer, hold friction at the minimum, reduce cost, keep shafts turning longer. These are all typical results of the Jack & Heintz *Mass Precision* technique that is being applied today not only to ball bearings but also to electric motors, compressors, aircraft accessories, electronic gauges and Eisemann magnetos. And tomorrow this same Jack & Heintz *Mass Precision* will bring other important developments that will make equally startling savings in industry and homes.

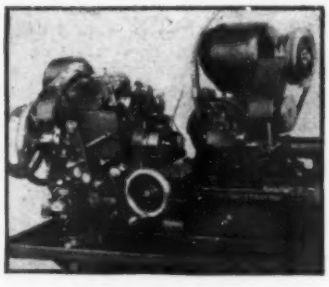
JACK & HEINTZ PRECISION INDUSTRIES, INC.

CLEVELAND 1, OHIO

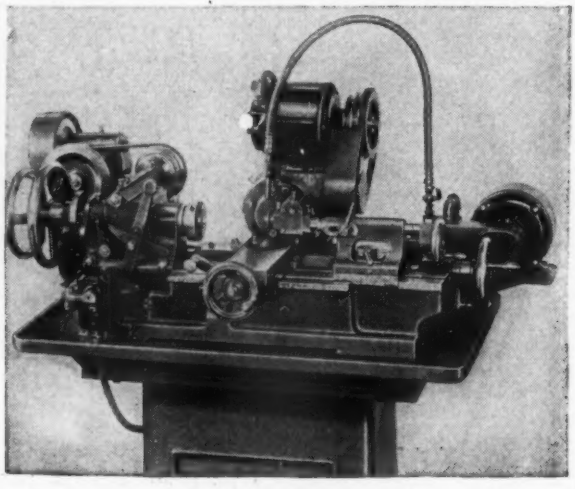
New!
REED
Cylindrical-Die
THREAD ROLLER
MODEL A22
REED
NO. A 22
The ROLLED THREAD DIE CO. announces the new Model A22 REED Cylindrical-Die THREAD ROLLER . . . worthy successor to the Model 21 which has for several years demonstrated the advantages of Reed-pioneered triple-die rolling.
The unusual range and flexibility of the A-22 provide for low production and inspection costs on a large variety of hollow parts, short threads on top-heavy parts, tapered threads, threads close to shoulders, and other difficult parts made of materials ranging from soft non-ferrous metals to semi-hard alloy steels.
Write for Bulletin A22-1 which contains complete specifications.
For PRECISION
Threading - Knurling -
Forming - Burnishing -
Serrating
ROLLED THREAD DIE CO.
Thread Rolling Dies and Machines
237 Chandler St., Worcester 2, Mass.



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

This POPE VERTICAL MOTORIZED GRINDER SPINDLE

With *sealed-in* lubrication and totally enclosed fan cooled motor has

the ***power***
the ***bearing capacity***
the ***rigidity***
the ***rugged ability***

to ***rough off surplus metal fast*** and at the same time give you a ***better final finish.***

Let us mail you data sheets covering 1200, 1800 and 3600 RPM and 3, 5 and 10 HP units.

No. 36

POPE

POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

PRECISION REID SURFACE GRINDERS

"for Close Tolerance Use a REID"

May we suggest that you check your surface grinding department? Are your machines doing precision work in an efficient and time-saving manner? It's sound reasoning to have this department in "top" condition. We want you to know that there's a Reid Distributor located convenient to you and he'll gladly give any information you may require on

REID *PRECISION* SURFACE GRINDERS

You'll find this machine capable of bringing your grinding department up to "top" performance on your precision work, reducing operating time and expense.

The Reid model 2-C hand-feed also is an exceptionally fine machine for tool, gage, die and certain production grinding.

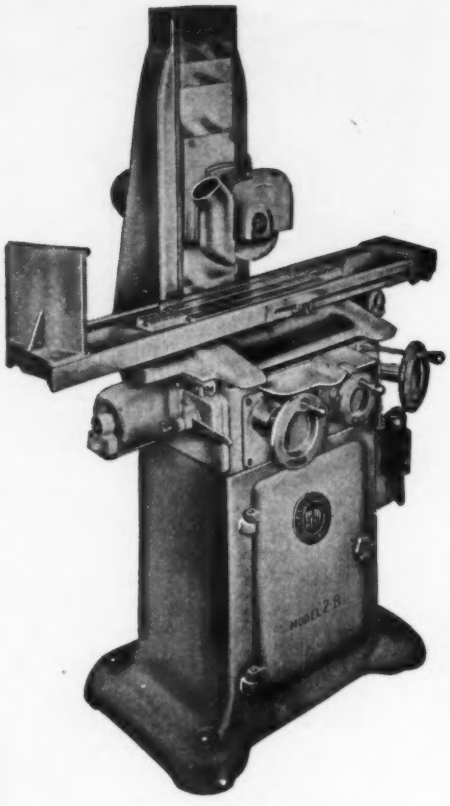
MACHINES EQUIPPED FOR WET GRINDING IF REQUIRED

EXCELLENT DELIVERIES

DISTRIBUTORS CONVENIENTLY LOCATED IN ALL SECTIONS

WRITE DEPT H FOR ILLUSTRATED BULLETIN AND PRICES

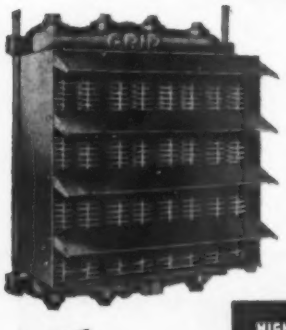
REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS



MODEL 2-B ALL ELECTRIC
6" x 18" Capacity

HERE'S WHY! **GRID*** **UNIT HEATERS**
LAST AS LONG AS THE PIPES FURNISHING STEAM TO THEM

* REG. U. S. PAT. OFF.



- One piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs.
- No soldered, brazed, welded or expanded connections to become loose or develop leaks.
- No electrolysis to cause corrosion, breakdowns, leaks, or heating failures.

It's the material that makes the differences. GRID High Test Cast Iron Unit Heaters are built to last for years—to last as long as the pipes furnishing steam to them. In many plant installations they have been operating for 16 years without maintenance.

HIGH TEST CAST IRON HEATING SECTIONS

Complete details upon request.

SEND for free booklet "Corrosion in Unit Heaters"

D. J. MURRAY MANUFACTURING CO.
WAUSAU • WISCONSIN

BENEFIT

When Hiring by Consulting Your Local

SERVICE MEN'S CENTER

TALIDE-*tipped* Blades Outwear Others 25 to 1

Talide Blades for centerless grinding have many natural advantages over cast iron, tool steel, and hard faced blades.

Tungsten Carbide has the greatest compressive strength of any known material. Talide Blades wear and wear. You can buy Talide Centerless Blades with the Talide Metal insert of any length in one solid piece. There are no sections or seams to scratch or mar the work. Scoring and galling cause no trouble.

This extra long service life gives you extremely high continuous production rates. Rejects practically disappear from your work sheet.

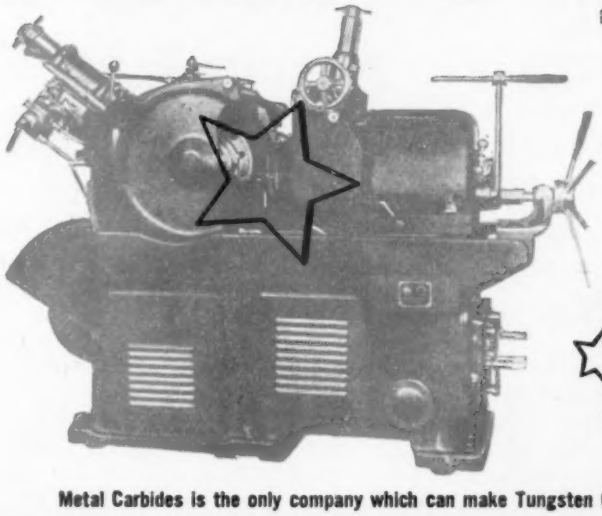
In precision grinding, all types of products...roller bearings, fountain pens, cap screws, twist drills, bushings, shafts, spindles, screw machine parts, Talide Blades always outperform other blades at least 25 to 1.

Metal Carbides Corporation, a pioneer in Tungsten Carbide, will assist you in designing super-hard Talide Blades for your work. Apply this 25 to 1 advantage to your production and watch those costs go down.

Send for Talide Blade catalog 43-W P, complete with prices, sizes, and specifications.

Standard Blades carried in stock

TALIDE METAL MEETS EVERY REQUIREMENT



Metal Carbides is the only company which can make Tungsten Carbide wear strips in one solid piece of any length

THE ENGINEERED CARBIDE FOR ALL APPLICATIONS

TALIDE

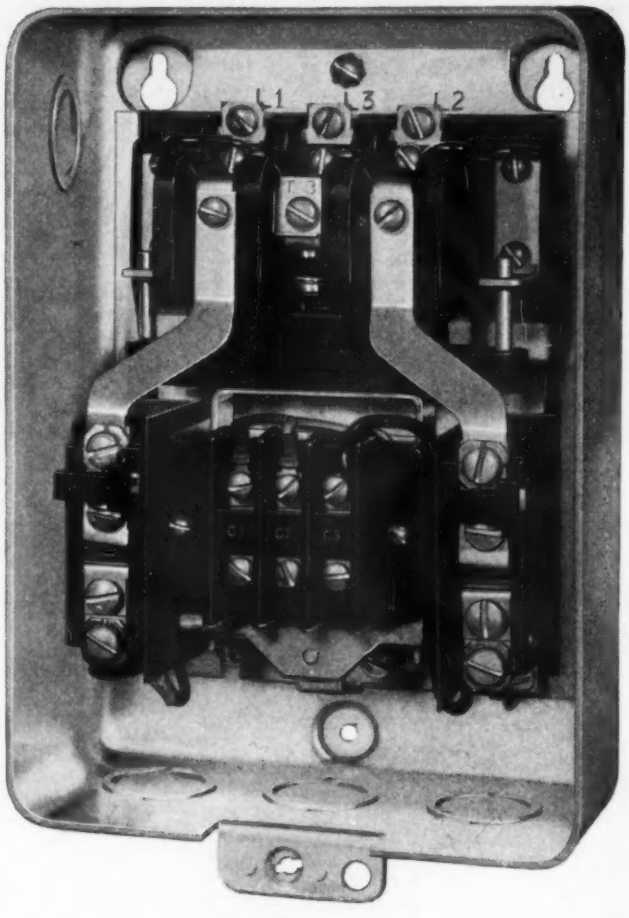
METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

SINTERED CARBIDES FOR CUTTING • HOT PRESSED CARBIDES FOR DRAWING AND WEAR RESISTANCE

YOU'VE SEEN THIS ANNOUNCEMENT OF THE MASTER MOTOR STARTER

Now The Lid's Off



Master Motor Starters have a great many distinguishing features which are quite evident when you remove the cover . . . so here is *an inside view* showing a few of the basic design innovations. (Across-the-line AC magnetic starter, Form B-1, requiring remote control station.)

Clean Design—From a glance at this interior you will appreciate the orderliness of layout and compactness of the entire assembly.

Simple Construction—All terminals and mounting screws easily accessible from the front. Heaters for overload relays also readily accessible.

Rugged Assembly—Exemplified by sturdy formed straps rather than flexible wire as jumpers from overload relays to contact terminals for added rigidity.

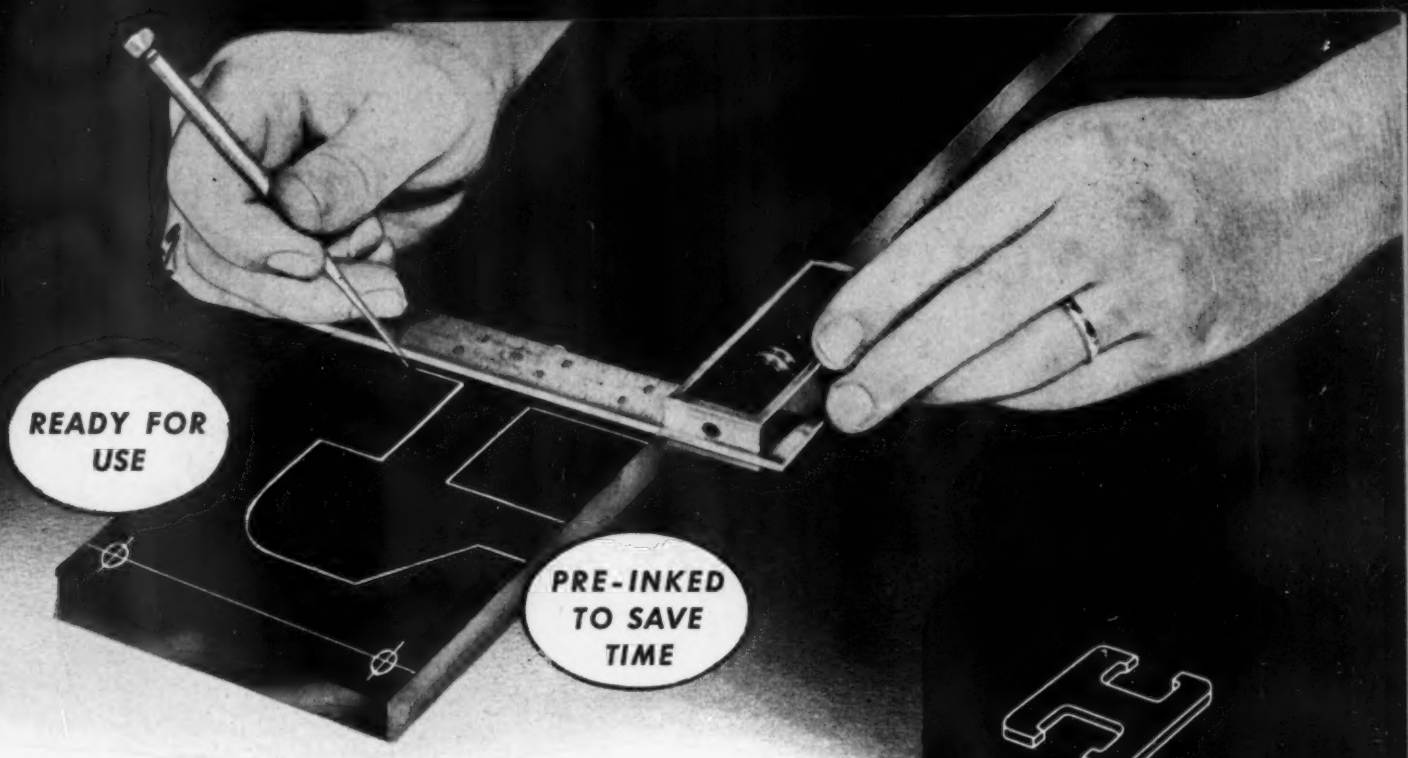
Ease of Installation and Maintenance
No trick arrangements to puzzle electricians. Starters for remote control have barrier type terminal boards with control connections plainly marked and with complete wiring instructions inside cover. All contacts are easily replaceable without removing mechanism from the case.

PUSH-BUTTON CONTROL

Master Single-Button Type—An exclusive Master feature is the single push-button which is used for both starting and stopping, and which has a signal flag to indicate whether the motor is "on" or "off." The illustration shows the remote control station with single push-button and indicator flag. The start-stop single button is also used where control integral with the starter is desired.

Conventional Two-Button Type—For applications where multiple remote control of a single starter is desired, the conventional two-button control can be furnished. *Write for Master Bulletin 200.*

THE MASTER ELECTRIC CO. MASTER **DAYTON 1, OHIO**



Finest Precision Ground TOOL *and* DIE STEEL

Precision Ground in Thicknesses up to 1"— Ready for Use!

All-Purpose: For punches and dies, gages, gears, cams, many tools and special machine parts as customarily made in toolrooms.

Slashes Steel Inventory: No need for bulging stockrooms of special-purpose steels. DoALL Steel fills all your toolroom requirements.

Pre-Inked to Save Your Time: Uniform coating of DoALL deep-blue, glareless layout ink, already applied, saves you time and trouble.

Protective, Moisture-Proof Packaging: Each piece in thick, easily removable plastic "jacket"—protects against corrosion and injury.

Precision-Ground: Superfine finish to within .001 of thickness and width.

No Decarburized Surface: Insurance against "bark" after hardening.

Non-Deforming...Oil Hardening: Properly hardened and tempered, DoALL steel is practically non-deforming and non-shrinking. Deep oil hardening, protects against cracking and wasting costly machining time.

Quality Steel Costs Less: Cost of tool steel averages 5% of machining costs. Therefore, a few extra dollars spent for DoALL Quality Steel is your best insurance against losses from cracking and warping—besides the economy of getting longer life tools.

Write for Circular No. TS-280

NEW MOISTURE-PROOF PACKAGING

The DoALL Company

DOALL STORES
PRINCIPAL CITIES

MACHINE-TOOL DIVISION
MINNEAPOLIS 4, MINN.

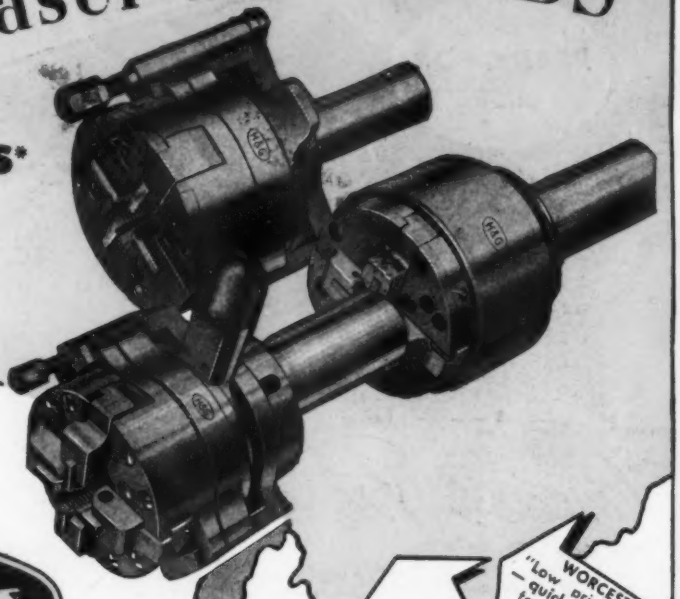
1946

Overwhelming evidence

FOR THE SELECTION OF

H & G Insert Chaser DIE HEADS

REASONS STATED BY USERS*



SEATTLE "More economical, more uniform hardening."

SAN FRANCISCO "Best adapted for B & S automatics."

LOS ANGELES "Long chaser life and good construction."

SAN DIEGO "Interchangeability of chasers for different types of die heads."

FOND DU LAC "Low investment in chasers."

GALVESTON "Best for small high speed automatics."

CLEVELAND "Large thread capacity for small body. Ease of regrinding chasers."

CINCINNATI "For close to shoulder threading."

DALLAS "Have better luck in holding tolerances."

BIRMINGHAM "Adaptability to wide range of materials and machines."

DAYTON "Hold size better. Threads straight and true."

PITTSBURGH "Prompt, cooperative service."

TORRINGTON "Retains accuracy longer."

HARTFORD "More threads per grind."

NEW HAVEN "Accuracy, performance, economy."

BEDFORD "Continued accuracy on long runs."

WORCESTER "Low price chasers. — quick to set — uniform high quality threads."

H&G Insert Chaser DIE HEADS

* Based on impartial survey.

H&G SPEED CALCULATOR

Foremen, Set-up Men and Engineers find the H&G Speed Calculator based on a circular slide rule formula very useful for arriving at proper feeds and speeds. It eliminates figuring; is a valuable time saver. FREE when requested by users of die heads. Otherwise 15c.

SEE H&G CATALOG IN SWEET'S FILE

Free **BULLETIN 10**

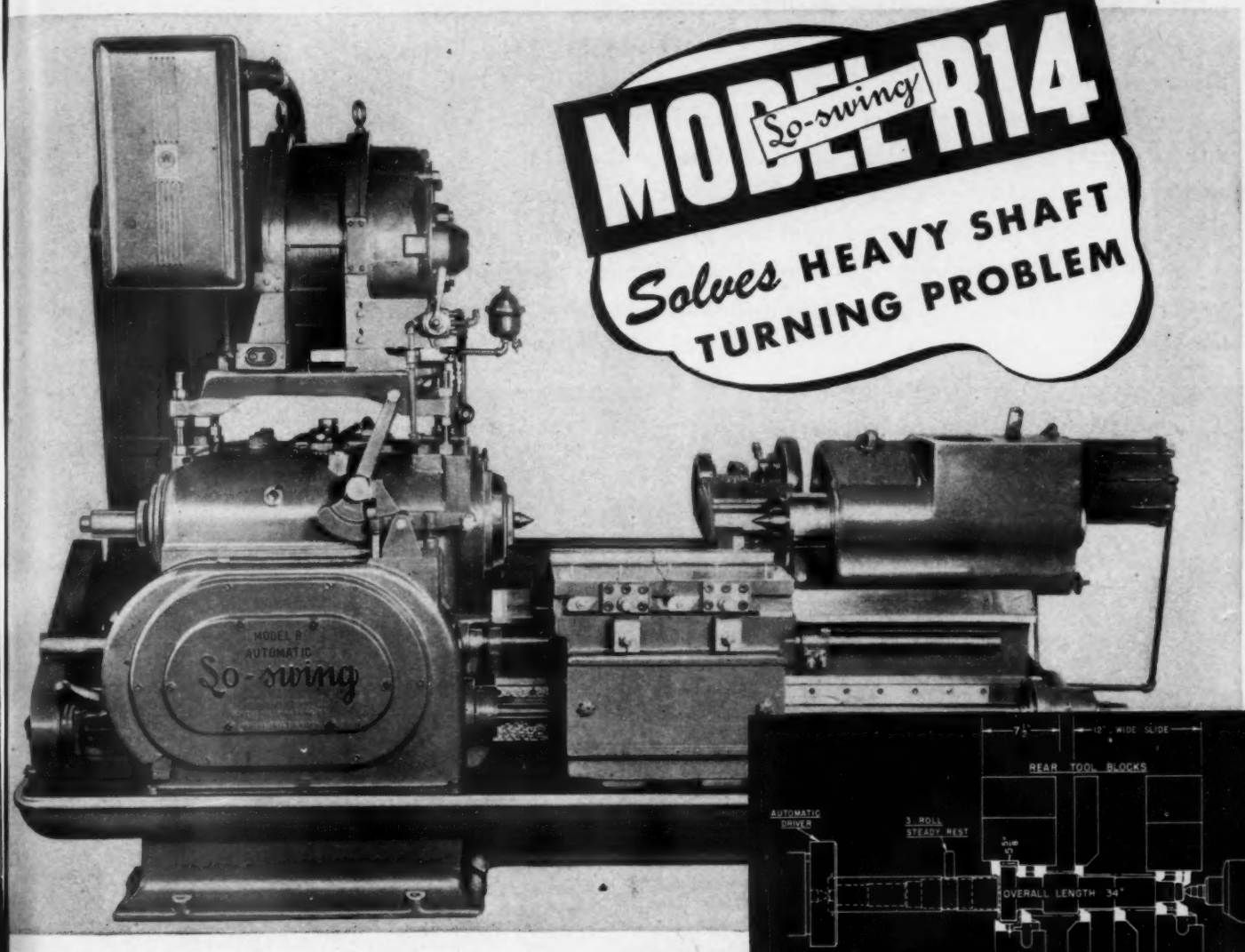
Briefly describes the famous H&G Insert Chaser Die Heads, available in a wide range of sizes and styles for all machines on which threads are cut.

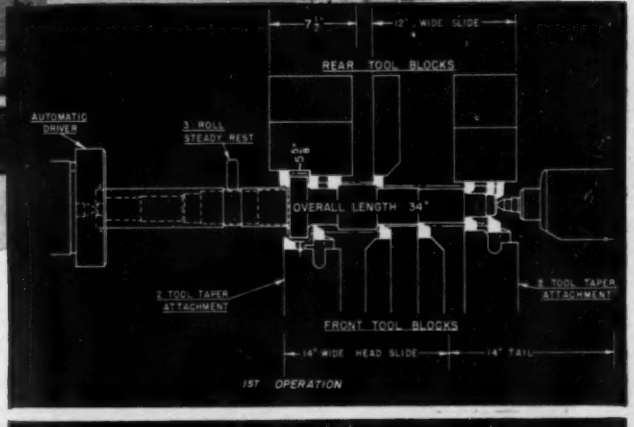
THE EASTERN MACHINE SCREW CORPORATION

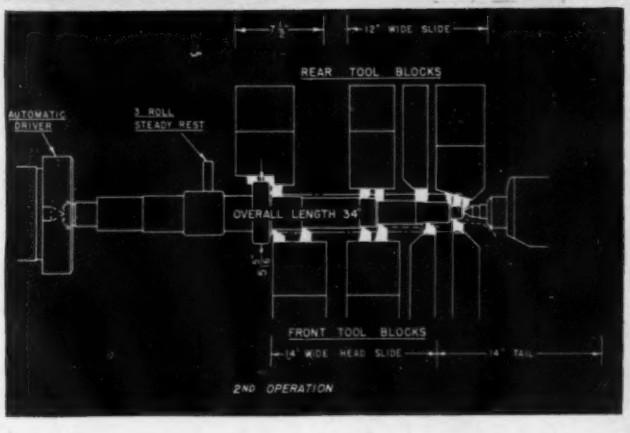
21-41 Barclay Street New Haven 6, Conn.

MACHINE OF THE MONTH

EPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK







lem: To provide a single Automatic Lathe capable of turning, g and undercutting a variety of heavy forged shafts and re- ng minimum time for change-over from job to job.

tion: The Model R-14 Automatic Lo-swing Lathe was chosen his job, primarily because it had the power and capacity nec- y to handle heavy shafts from 3" to approximately 8" diameter. built-in, Quick Change-over Mechanism on this Lathe also pro- l a simple and speedy means for varying the carriage stroke, quired for each individual shaft.

forged shafts come to the Lathe centered on both ends and ed for the three roll steady rest (first operation only). One end e shaft is first turned and faced, then reversed (second opera- and the other end turned and faced as shown in the line draw- The shaft is driven with a Standard Seneca Falls Automatic Driver which prevents slippage of the piece, thus taking full ntage of cemented carbide tools with high cutting speeds and e feeds.

ECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

"And there's your answer, Jim"

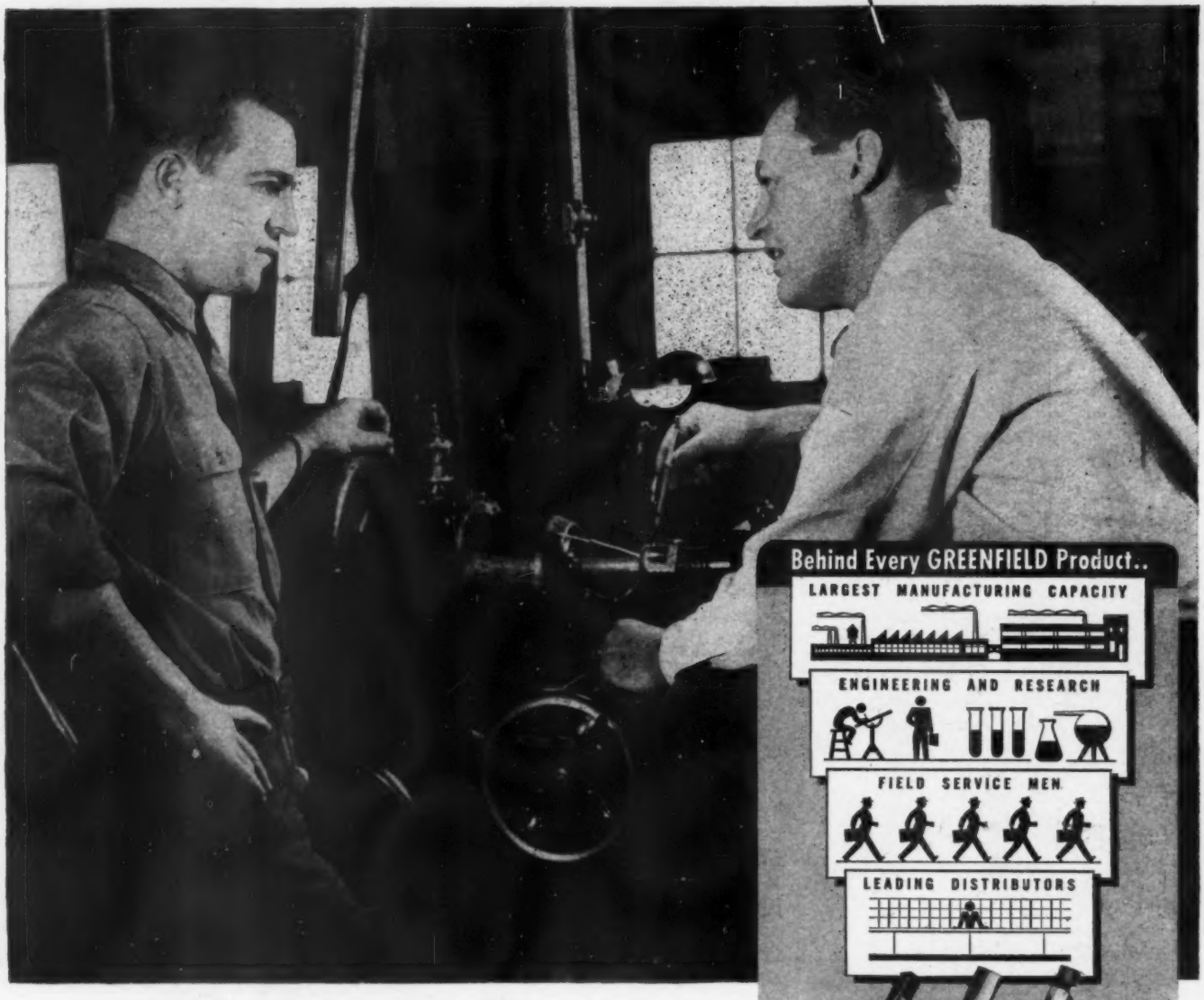
In a few minutes, this threading operation will be cutting production costs by increased performance . . . .

The scene below is taking place every day in plants all over the country.

The man on the right is the "Greenfield Man"—a trained field engineer with the "know-how" to get the right answer to a threading problem, and the "show-how" to pass along this information so it can be put into practical use.

Is your plant making full use of "The Greenfield Man" in your territory? *If not, and if you have a threading problem, call the "Greenfield" Man through your "Greenfield" distributor today!*

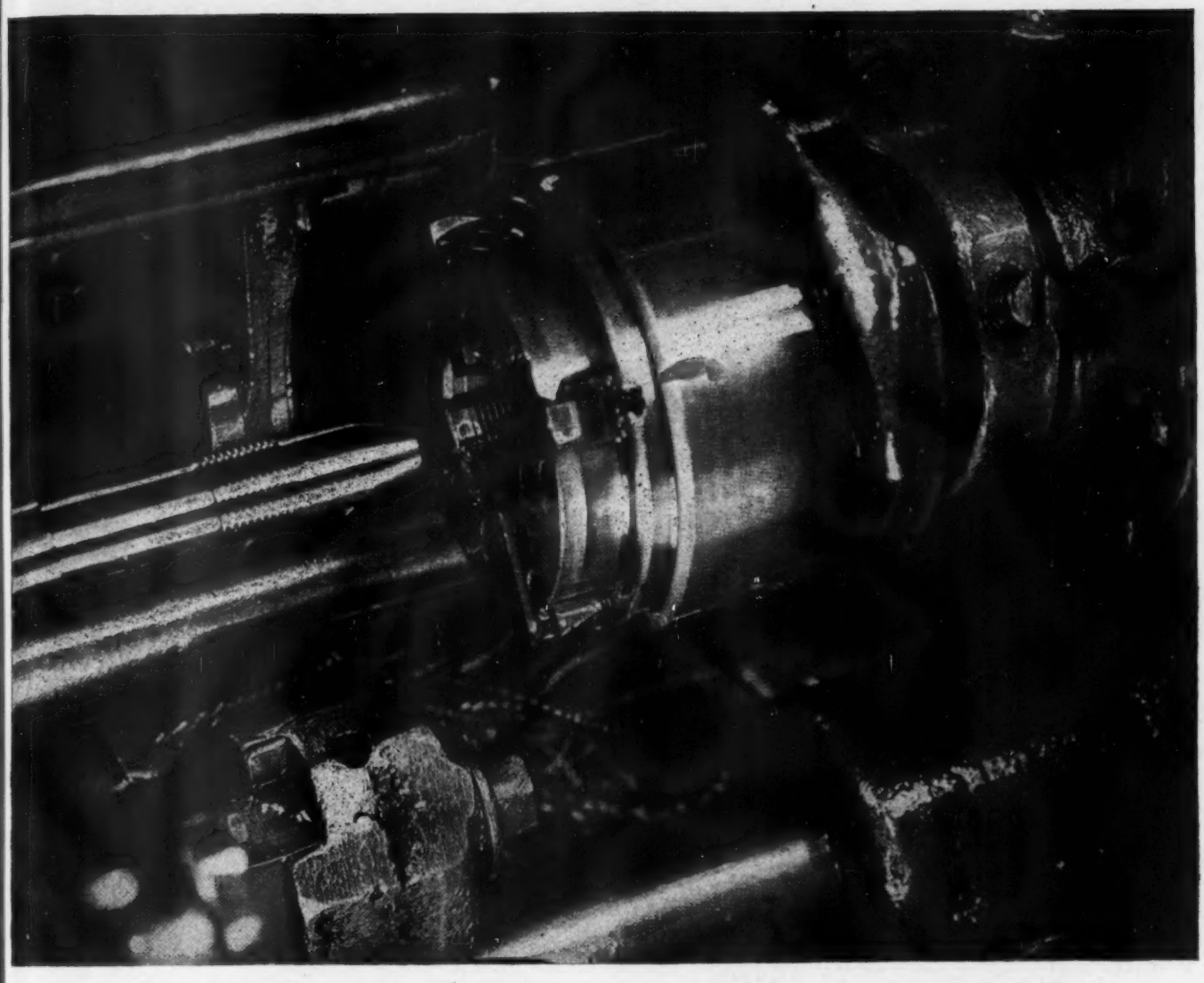
GTD GEOMETRIC



GREENFIELD

GREENFIELD TAP and DIE CORPORATION

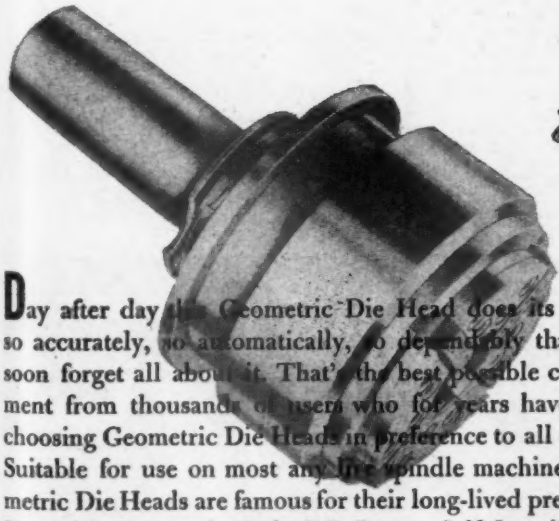
GREENFIELD, MASSACHUSETTS



A Die Head You Can Forget!

FOR NEARLY EVERY THREADING JOB—A GEOMETRIC!

If you have in mind a particular threading problem, we will be glad to have our engineers give you their recommendations, based on over a half century of specialization in this field. Why not let us send you the latest Geometric catalog?



Day after day this Geometric Die Head does its job—so accurately, so automatically, so dependably that you soon forget all about it. That's the best possible compliment from thousands of users who for years have been choosing Geometric Die Heads in preference to all others. Suitable for use on most any live spindle machine, Geometric Die Heads are famous for their long-lived precision. Here this Geometric Style KD Rotary Self-Opening Die Head is cutting a $\frac{3}{4}$"-16 N. F. thread on a hollow chuck component. Note its compact and rugged design, particularly adapted to multi-spindle automatic screw machines. *Write for complete details about the "Style KD" and other Geometric Die Heads.*

THE
GEOMETRIC
TOOL COMPANY . . NEW HAVEN 15, CONN.
A Division of Greenfield Tap and Die Corporation

HEAT TREAT SMALL PARTS

In Your Own Plant

ESSENTIAL FOR TOOL AND DIE SHOPS

You save time and money heat treating small tools and dies in a Cooley Electric Furnace. Uniform temperatures are maintained throughout the furnace chamber to assure even heating of parts. The heating elements are embedded in refractory materials, protecting against atmospheric attack. They are easily replaceable.

ECONOMICAL TO OPERATE

To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. The MH-4 furnace requires less than 2.5 kw. or under 5c per hour at the same rate. Cooley Furnaces are easily installed—ready for immediate service by connecting power lines to two terminals. Quiet in operation—no fumes or odors—no ventilating necessary—they can be located at any convenient place in the shop.

MORE PROFITABLE REASONS FOR USING COOLEY FURNACES

1—Hardening, drawing and tempering small batches in large furnaces is uneconomical.

2—Small parts can be normalzied and annealed quickly and easily.

3—Convenient for pre-heating prior to high-speed hardening.

4—Always available to handle emergency repair work without delay.

5—Use as a pilot furnace to predetermine techniques for production heat treating.

TWO NEW OPTIONAL FEATURES AVAILABLE

1. Vertical Lift Door—Counterweighted for ease of operation—conserves heat where door need not be fully opened to enter or remove work. Supplied in place of standard hinged hearth door at $20.00 additional to regular furnace prices shown below.

2. Heavy Gauge Steel Stand—For ease of installation and operation—locates furnace at most convenient operating height and provides additional working and storage space. Add $35.00 to regular furnace prices shown below.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps: 115 V	Watts	Amps: 230 V	Price
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$146.00*
MH-4	10″W 6″H 18″L	——	4800	20.9	$222.50*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—price depends on selection—approximately $150.00.

NO SALESMEN WILL CALL

Ask for free information and ordering instructions so you can make your own decision and determine your own requirements. Write for Bulletin No. 50 today—no obligation.

COOLEY ELECTRIC MANUFACTURING CORP.
48 South Shelby Street Indianapolis 7, Indiana
INDIANAPOLIS MACHINERY EXPORT CORP.
Export Manager, 44 Whitehall Street, New York, New York

TU-MY-CO

TRADE TUMICO MARK

SNAP GAGES

EASY to USE

TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue.

Hermetically sealed, low thermal conductivity, less expansion. Triple plated—copper, nickel and chrome, buffed and polished—an attractive, high quality precision tool.

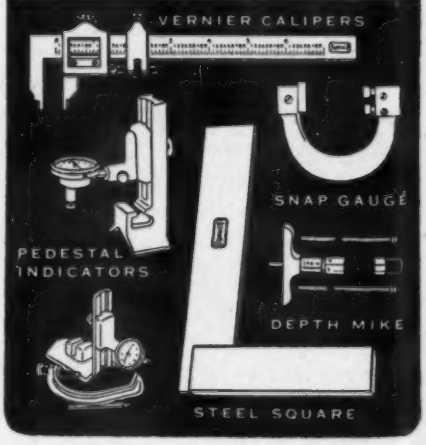
TU-MI-CO PRODUCTS

include a complete line of Micrometers, Pedestal Indicators and Micrometers, Standards, Steel Squares, and other practical measuring instruments. Ask your jobber.

Precision is a TU-MI-CO tradition

WRITE FOR BULLETIN AM-G

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA, U. S. A.
Milwaukee Branch • Plankinton Bldg.



MUNICIPAL AUDITORIUM
ATLANTIC CITY

NOVEMBER 18-22, 1946

LOOK TO THE METAL SHOW FOR PRODUCTION IDEAS

Every metal man can be a seer and get real production ideas just as quickly and easily as looking into a crystal ball by visiting the 28th annual National Metal Congress and Exposition, Atlantic City Municipal Auditorium, Nov. 18 to 22. This big event concentrates the latest ideas of more than 300 manufacturers in operating displays at the Exposition . . . concentrates the research developments of industry in fast-moving technical sessions sponsored by four great national societies.

All exhibit space in the vast Auditorium and Exhibit Hall will show advances in ferrous and nonferrous metals, in equipment and processes for heat treating, welding, cutting, brazing, machining, cleaning, plating, die casting — and a hundred-and-one other products — many shown in actual operation.

More than 100 research papers on many metal topics will be presented by outstanding metal industry experts during sessions of the Metal Congress. You will find production ideas at all of these meetings and in conversations with other metal men who will attend this annual event.

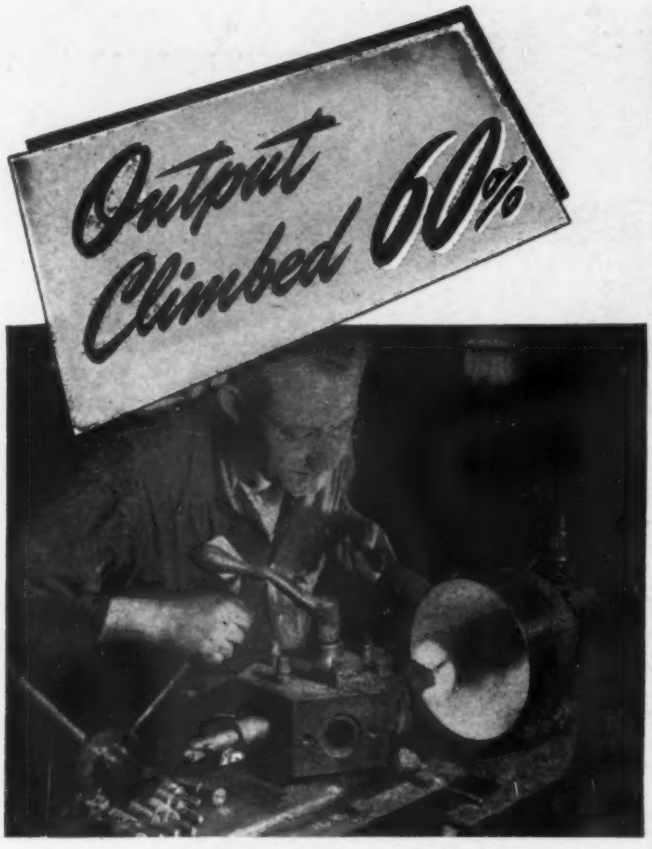
Show time is close at hand — November 18 - 22, Monday thru Friday. Make your plans to attend right away — write for hotel accommodations to the Housing Bureau, National Metal Congress and Exposition, 16 Central Pier, Atlantic City.

ATTENTION MANUFACTURERS —

A few good exhibit locations are still available. If you have a product to introduce — a metal industry market to cultivate, wire or phone for space details to W. H. Eisenman, 7301 Euclid Avenue, Cleveland — Phone Endicott 1910.

NATIONAL METAL CONGRESS AND EXPOSITION

Sponsored by the American Society for Metals
in cooperation with
The American Welding Society . . . The Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers . . . American Industrial Radium and X-Ray Society.



WITH A *Barker* WRENCHLESS CHUCK

Production shot up from 75 to 120 bronze plugs per hour when the Atlantic Brass Works installed a Barker Two-Jaw Wrenchless Chuck. The operations are center, face, and box mill. The lathe is not stopped to set or remove the work.

Barker Wrenchless Two-Jaw Chuck

Barker Wrenchless Three-Jaw Chuck

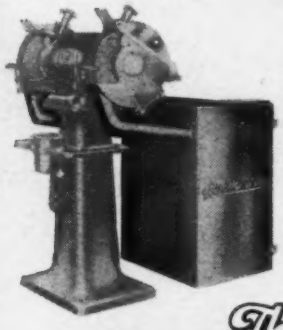
The experience of this user is typical of the reports from hundreds of manufacturers who are operating Barker Wrenchless Chucks—substantial dividends in more parts per hour, and lower cost per part.

You, too, can have these vital advantages. Write today for full information!

THOMAS HOIST CO.
Chuck Division
20 South Hoyne Avenue, Chicago 12, Illinois

TINY . . . BUT DESTRUCTIVE!

Millions of tiny particles of dust and grit fly off unprotected grinder and buffer wheels daily . . . enter and injure the lungs of your employees . . . cause breakdowns of expensive machinery by getting into sensitive moving parts and bearings. Eliminate dust and grit by installing the AIR MASTER.



The AIR MASTER sucks dust and grit right off the whirling wheels of grinders and buffers, leaving the air free from these destroyers of health and machinery.

The AIR MASTER is fully self-contained . . . efficient, rugged, dependable. A size for every grinder and buffer.

Write today for full details

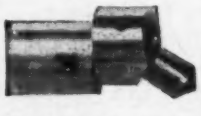
ELECTRIC DRILLS · GRINDERS
BUFFERS · PORTABLE TOOLS
AIR MASTER DUST COLLECTORS

The Cincinnati ELECTRICAL TOOL CO.
Division of THE R. K. LeBLOND MACHINE TOOL CO.
2615 MADISON ROAD · · CINCINNATI 8, OHIO

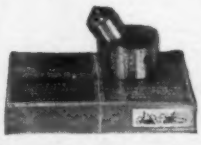
WANT BETTER GRINDING? SHARPER DIAMONDS? FEWER DRESSINGS?

Put the new Booth 3-Angle Turret Diamond Holder on that "finish" dressing job and see how it improves the cut of your wheel. See the automatic, self-leveling action maintain the diamond point at a fixed level with 30°, 20° and 10° drag angles. 3 drag angles give 3 cutting points—double diamond life—reduce re-sets. 3 Angles assure a sharp, clean-cutting diamond—make dressings accurate, improve grinding—save diamonds, save wheels, increase production.

THE NEW *Booth*
3-ANGLE TURRET DIAMOND HOLDER



Turret Holder with Adapter Rod



Turret mounted on Block for Surface Grinders

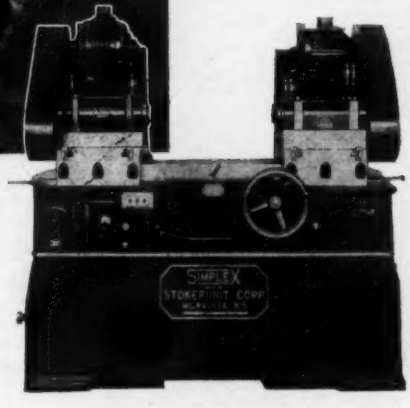
Available on a rental basis of $2.00 per month, payable six months in advance. Rental includes Turret, Block, Adapter Rod, maintenance, repairs, and engineering installation service. Satisfaction guaranteed. (Give make, type and size of grinder when ordering). Specify Booth Turret equipment on your new grinders.

Loc-Key-Set Diamonds (Common 12.00 Carat, Medium 24.00 Carat, Select 48.00 Carat) mounted to fit Turret. Specify Carat size and Quality in ordering.

Diamond Tool Co.
(Not Inc.)
Sheldon M. Booth, President
938 E. 41st St. Chicago 15, Ill.
Customers' Overnight Quarters

MATTISON GRINDER
Cuts Finishing Time From 22 Hours to 4 Hours on Bed for Precision Boring Machine

The job being ground on the Mattison Grinder is a bed for the Simplex No. 200 Double End Series Precision Boring Machine shown below.

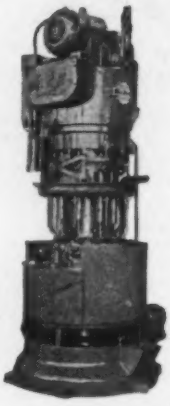


The hardened steel V-shaped and flat ways of the Simplex precision Boring Machine bed are ground to close limits of accuracy at a considerable time saving with the Mattison Grinder. Previous method required 22 hours. Present time is 4 hours. Special truing device is used to dress wheels to correct angle when grinding V-shaped ways. Similar results are obtained on numerous other jobs both small and large by the Stokerunit Corp., builders of Simplex Machines.

In your efforts to cut costs and obtain maximum production it will pay you to check into the capabilities of the Mattison Grinder.

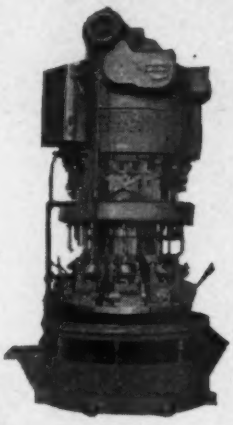
Write *for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.*

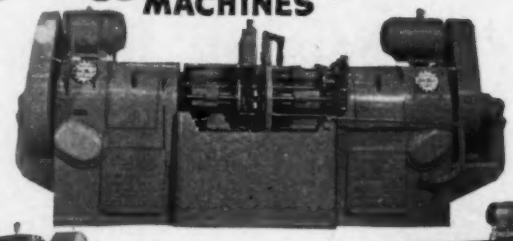
MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

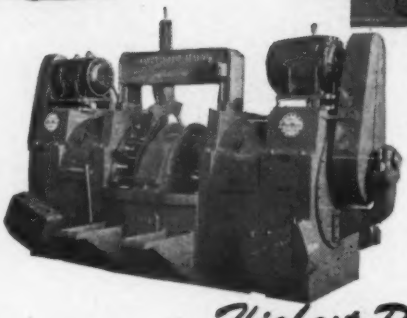


Roto-Matic Drilling MACHINES

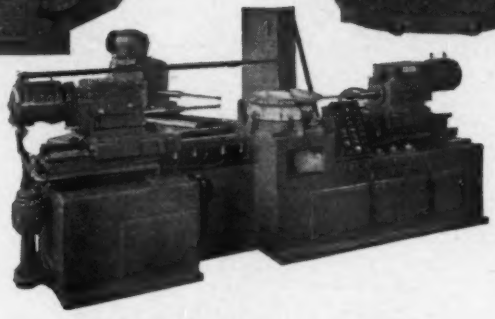
VERTICAL AND HORIZONTAL TYPES







MULTIPLE SPINDLES



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FRANK E. EBERHARDT, *President*

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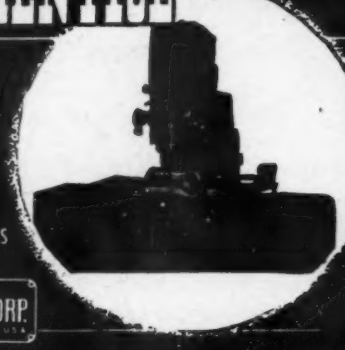

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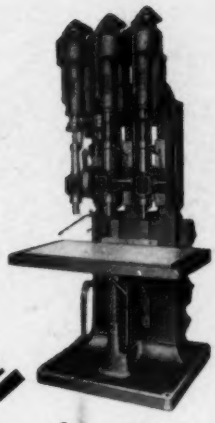
A BETTER DRILLING MACHINE

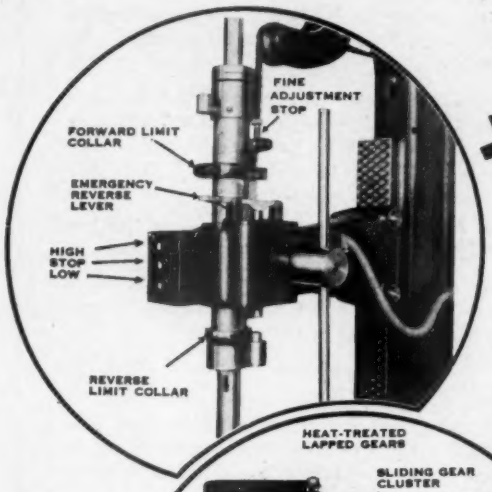


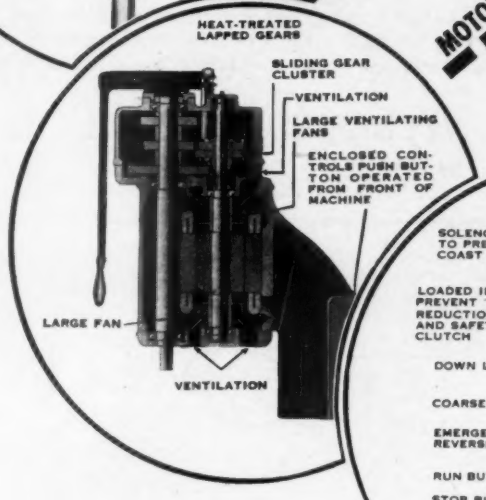
HAND FEED REVERSING MOTOR FOR TAPPING

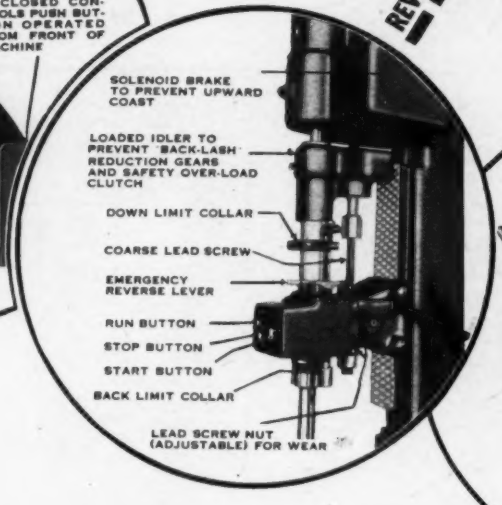
MOTOR & GEAR BOX CONSTRUCTION OF 6 SPEED MACHINE

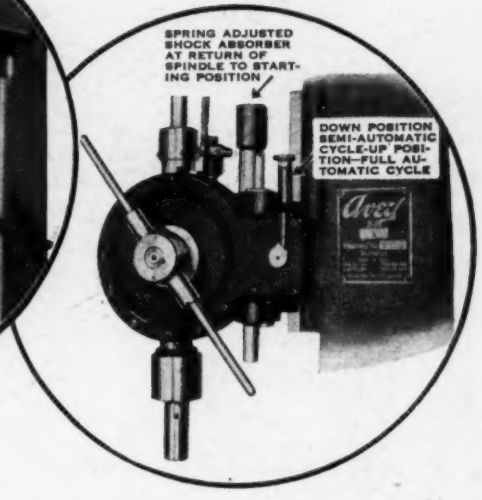
REVERSING MOTOR—POSITIVE LEAD SCREW TAPPING

SINGLE LEVER CONTROL—AVEYMATIC POWER FEED






SOLENOID BRAKE TO PREVENT UPWARD COAST
LOADED IDLER TO PREVENT BACK-LASH REDUCTION GEARS AND SAFETY OVER-LOAD CLUTCH
DOWN LIMIT COLLAR
COARSE LEAD SCREW
EMERGENCY REVERSE LEVER
RUN BUTTON
STOP BUTTON
START BUTTON
BACK LIMIT COLLAR
LEAD SCREW NUT (ADJUSTABLE) FOR WEAR


SPRING ADJUSTED SHOCK ABSORBER AT RETURN OF SPINDLE TO STARTING POSITION
DOWN POSITION SEMI-AUTOMATIC CYCLE-UP POSITION—FULL AUTOMATIC CYCLE

The Avey Type MA-6 is made in the following capacities

No. 2— 7/8" capacity in cast iron
No. 3—1 1/4" capacity in cast iron

Any spindle of MA-6 can be arranged with any one of above FEATURES giving ease of operation —ideal for production set up.

Avey DRILLING MACHINES
CINCINNATI, OHIO

VITRIFIED

Keep production on its toes by standardizing on . . . .

VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels.

. . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

Vitrified Wheels

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WESTFIELD MASS.

Better grinding fluid means Better Grinding

Stuart's
CODOL
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. . . The best grinding fluid you can use!

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DIAMOND WHEELS

The full line of JKS Secomet diamond wheels consists of resinoid, metal and vitrified bonded types. In order to produce perfect finishes on carbide tipped tools and other required metal surfaces, diamond powder is evenly graded by a unique JKS scientific process and uniformly distributed throughout the bonds. Select your wheels from Price List No. 45.

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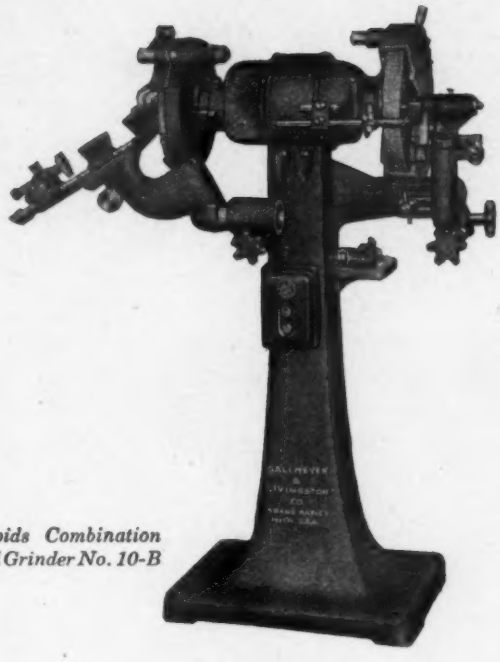
GRAND RAPIDS GRINDING MACHINES



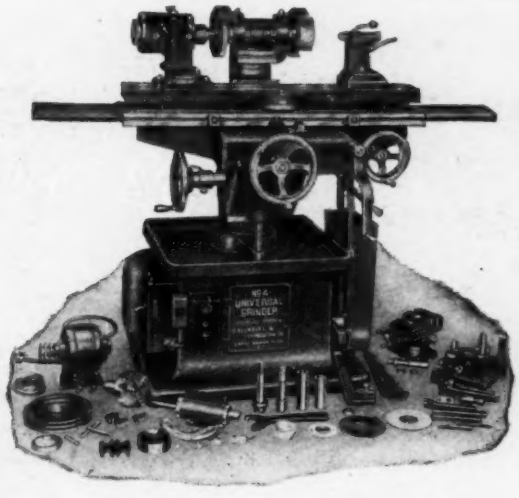
Grand Rapids Combination Tap & Drill Grinder No. 10-B

DELIVER TOP TOOL ROOM EFFICIENCY

Whether you need a Universal Cutter and Tool Grinder or a Combination Tap and Drill Grinder, you can be sure of top tool room efficiency if they bear the name "Grand Rapids," manufactured by Gallmeyer & Livingston Co.

With the Combination Tap and Drill Grinder you save three ways: 1. On first cost, 2. Through lower maintenance expense, 3. On valuable floor space.

With Grand Rapids No. 4 Universal Cutter and Tool Grinder you can handle complex tool grinding jobs with maximum speed and convenience. **Write now** for bulletins 1045 and G. L. 9-15-44.

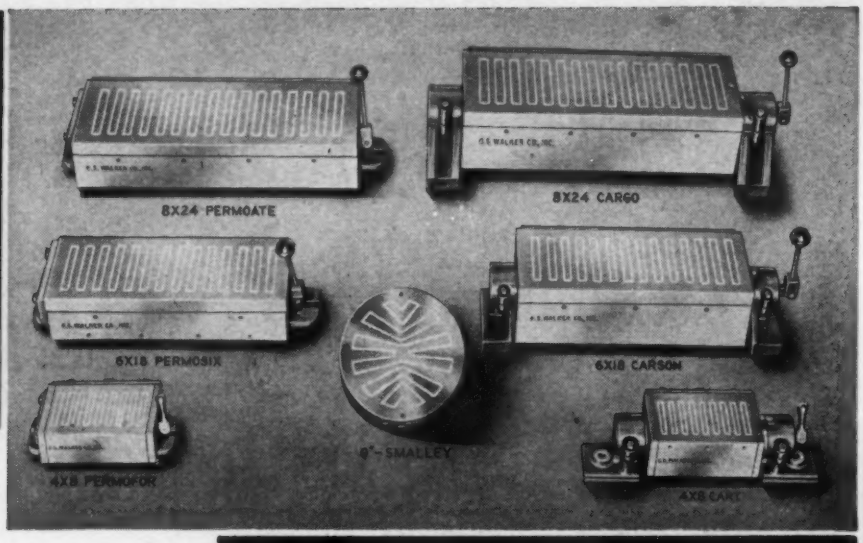


Grand Rapids No. 4 Universal Cutter and Tool Grinder.

What "GRAND RAPIDS" Quality Means: Gallmeyer & Livingston cast their close-grained gray iron, machine to micrometric tolerances, precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means *top* quality in grinding machinery.

GALLMEYER & LIVINGSTON COMPANY, 330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

Walker Chucks



Truly a credit to the O. S. Walker Co., Inc.

Over 60 years of chuck building, design, and engineering experience is incorporated into these PERMOS.

WALKER ENGINEERS invite you to present your problems for solution at no obligation.

REMEMBER there is a WALKER CHUCK for every known application.

O. S. WALKER CO., INC.

Original Designers and Builders of Magnetic Chucks

Worcester 6, Mass.

This is the WALKER PERMANENT CHUCK FAMILY

Just ONE setting per form
Just ONE continuous motion

"Fluidmotion"

FEATURES:

.0001" accuracy • Automatic Centering "Fluidmotion" dressing • Dustproof and chatterless hardened stainless steel 7" & 14" wheel capacities • Highest quality diamonds.

Prominent users tell us that they consider "Fluidmotion" Radii & Angle Dressers the finest precision dressing instruments procurable—regardless of cost. They obtain greater accuracy, longer wheel life, and much faster setup and operation.

We'll be glad to send you complete information. Write

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24" x 4" x 2¼"
BOND 30 1034 RPM

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GRINDING WHEELS

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100	Grit 36	Grade I
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50	Grit 30	Grade H

This limited supply of Grinding Wheels are packed in the original cases. Absolutely NEW! Have never been used. . . . Place your order now for immediate delivery while the supply lasts.

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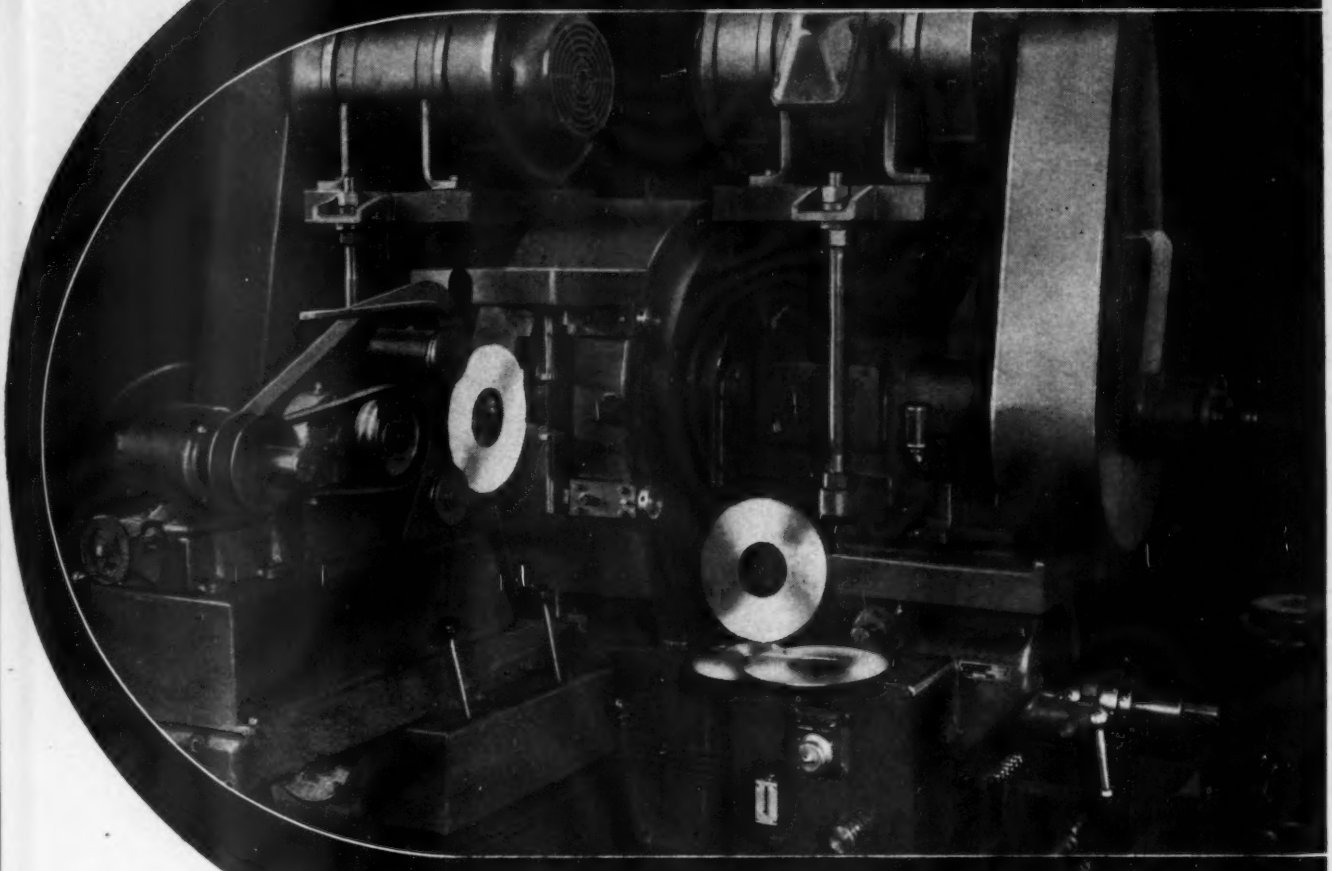
YOUR *Thin* CIRCULAR WORK *NOW* CAN BE · · ·



GARDNER-GROUND

THIS *new* Gardner development opens up a new field for *thin*, parallel-surface work requiring close accuracies.

The spring-steel automobile clutch plate seen here, measures 10⅝" O.D. by 4⅛" I.D. by .055" thick — too thin to be fixtured by conventional Double Disc Grinding methods. The large area involved, necessitates rotating the plate mechanically, rather than relying upon the spinning action caused by the opposed grinding wheels, which was standard practice in the past.

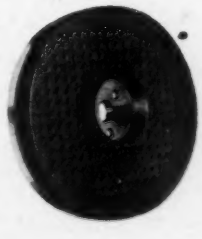
This Gardner No. 120A-26" Double Grinder carries an hydraulically-operated work table, mounted on a stationary knee. Two driven groove-type rollers contact the O.D. of the clutch plate, while a small straight roller contacts the I.D. under spring pressure, holding it into the driving rollers. Positive rotation and resulting close accuracy are assured.

PRODUCTION: 20 to 25 pieces per hour.

TOLERANCES: .002" for parallelism. .004" for uniformity.

STOCK REMOVAL: .020" maximum overall.

Use Modern GARDNER WIRE-LOKT Abrasives on YOUR Disc Grinders!



GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street · · · · Beloit, Wisconsin, U.S.A.

Sensitive Tapping Head for Fast, Accurate Tapping

- **Cover clamping eliminates chatter**
- **Rigid mounting reduces vibration**

The Procunier cover clamping tapping head is ideal for light, sensitive drill presses. It clamps directly to the drill press quill for greater rigidity and freedom from chatter. Vibration and the tendency to "run-out" or "bell mouth" is minimized because of the short, rigid mounting.

Procunier Sensitive Hi-Speed Tap Heads are precision built for accurate tapping at high speeds. Driven by a double-cone, cork-faced friction clutch, the tap is protected by a soft "cushion" effect. The operator can quickly detect the presence of a dull or "loaded" tap by the amount of pressure needed to drive the tap. Bottom tapping is done as easily as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.

Send coupon today for bulletin giving full details, specifications and prices.

PROCUNIER "TRU-GRIP" TAP HOLDER

The new "Tru-Grip" is a smaller, lighter and more accurate tap holder. A broached section in the chuck receives the flattened surfaces on the spring collet, while the tap has a positive drive through the square hole in the collet. The tap is held in alignment by the round and driven by the square—taps are never scored or "chewed up."

FAST, ACCURATE EXTERNAL THREADING WITH ACORN DIES

Do external threading jobs faster with a Procunier Tapping Head which holds standard Acorn dies. Cut external threads quickly in brass, die castings and aluminum.

PROCUNIER SAFETY CHUCK CO.

14-18 S. CLINTON STREET CHICAGO 3, ILL.

MAIL THIS TODAY

PROCUNIER SAFETY CHUCK CO.
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Send me bulletins on ☐ Procunier High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines

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Your manpower is an expensive investment! One way to protect that investment is to help employees keep their feet . . . do more work in less time on foot-safe floors cleaned with Oakite floor cleaning materials.

For example, to de-hazardize water and oil on floors around machinery, try the new DRY method using Oakite Composition No. 71. Just spread this granular, absorbent material on slippery areas. Thirsty Oakite Composition No. 71 quickly, speedily soaks up oils, coolants and drippings—while you work!

Full facts on your floor cleaning problem—FREE. Write right NOW!

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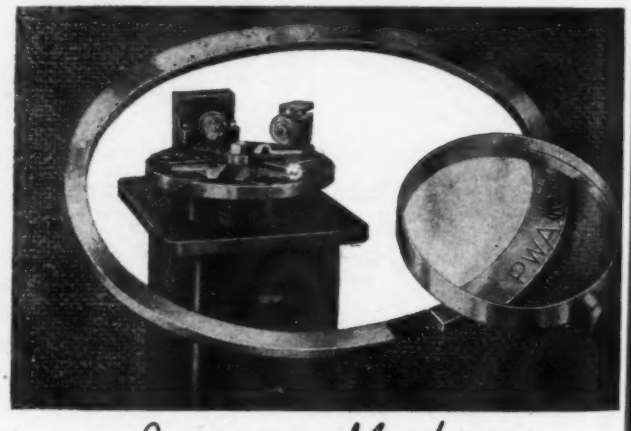
Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE Specialized CLEANING

MATERIALS METHODS SERVICE FOR EVERY CLEANING REQUIREMENT



Precision Marking

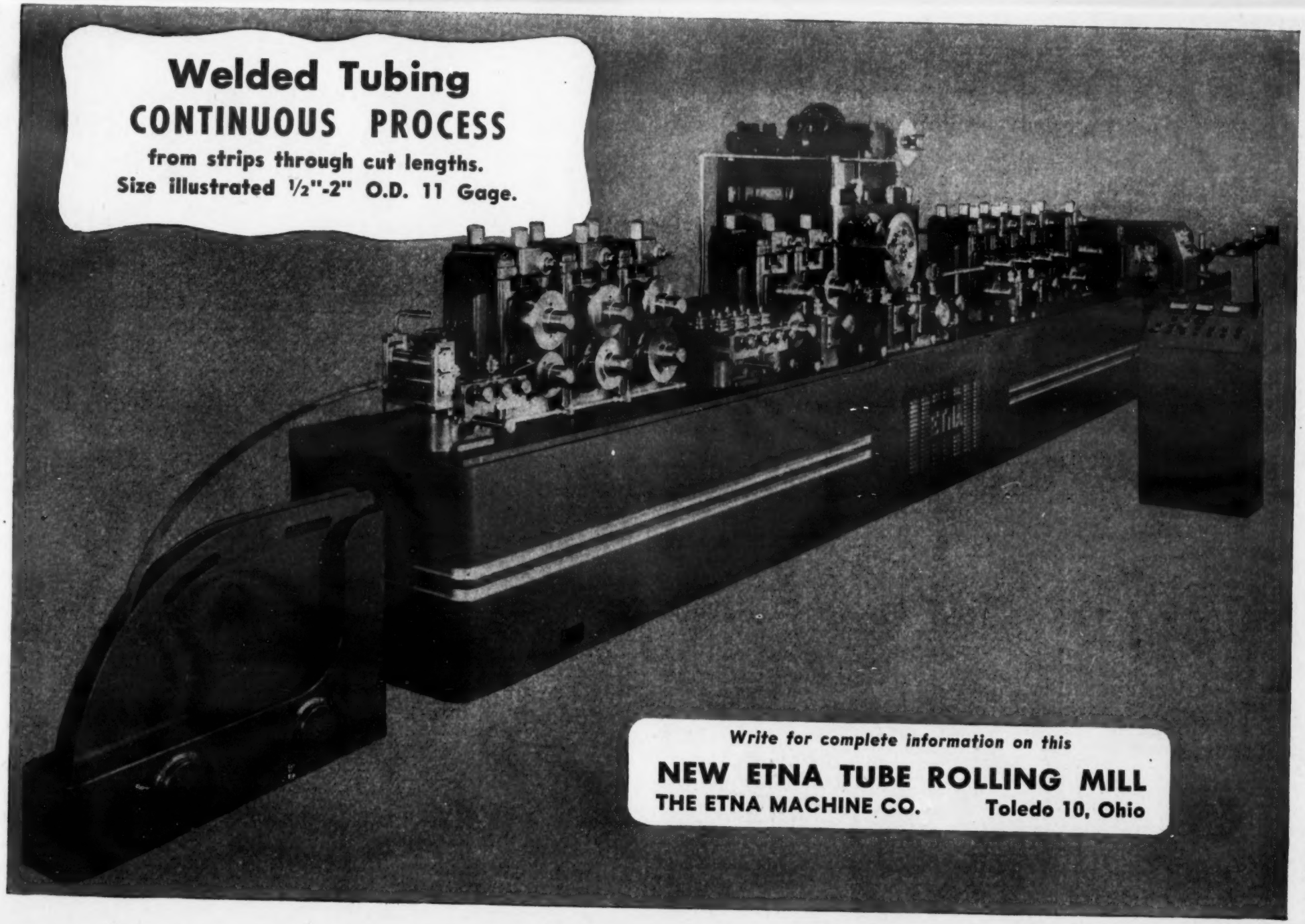
Since the beginning of this century Noblewest engineers and craftsmen have devoted their efforts to Precision Marking at highest speeds and lower costs. As a result today's Noblewest machines are universally the standard for Rapid Precision Marking as exemplified by Model 183, shown above, designed especially for marking aircraft engine piston rings where distortion of thickness must be held to within .001 of an inch. Why not let us solve your marking problems? Whatever they are, we have the answers. Write Noble & Westbrook Manufacturing Co., East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST

Hi-Speed Marking Machines

Welded Tubing
CONTINUOUS PROCESS
from strips through cut lengths.
Size illustrated ½"-2" O.D. 11 Gage.

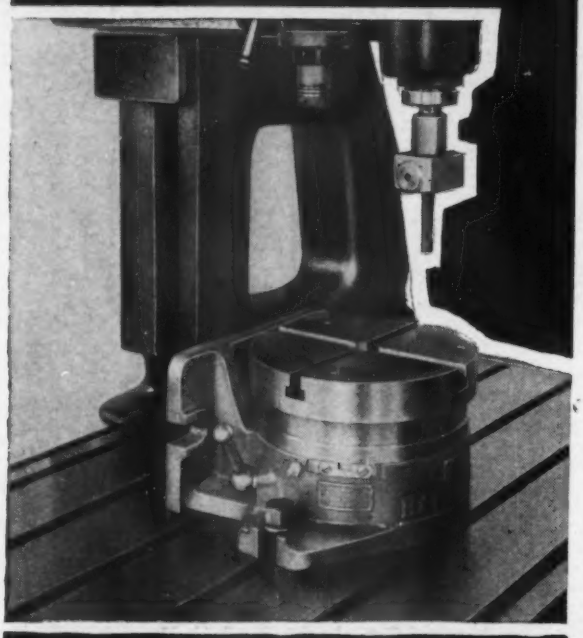


Write for complete information on this

NEW ETNA TUBE ROLLING MILL

THE ETNA MACHINE CO. **Toledo 10, Ohio**

JIG BORING



THE HARTFORD
SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

Another Application of the HARTFORD SUPER-SPACER

which demonstrates its accuracy

The Hartford Super-Spacer, because of its precise indexing, provides a practical, useful and convenient means of spacing on jig boring operations. This application is simply made by equipping the Super-Spacer with a face plate. The fact that this device is sufficiently precise for jig boring is indicative of its accuracy for all classes of work where indexing is required.

Other applications of the Hartford Super-Spacer where set up time is being saved include milling, drilling, boring, planing, slotting and grinding. Its use on single piece work or work in quantity is both practical and profitable. Because of its foolproof method of operation, the Hartford Super-Spacer does not require any special skill to handle and obtain maximum results.

There are several attachments for use with the Hartford Super-Spacer which adapt it to a wide range of work and which simplify set up. It will be to your advantage to explore the possibilities of this modern spacing device on your indexing work. Descriptive literature is available promptly on request. *Ask for it.*

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

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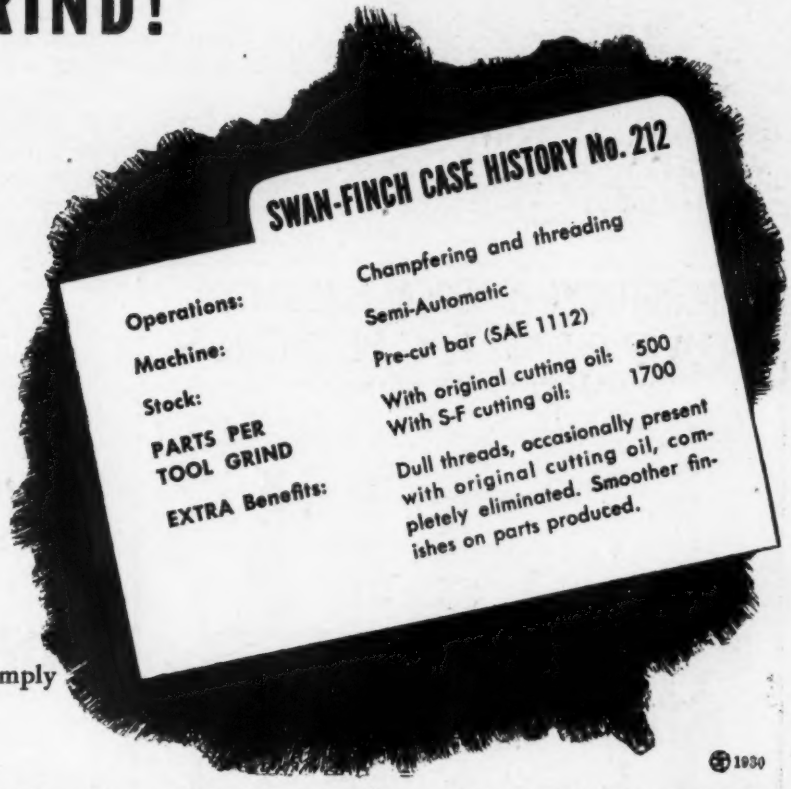
The Swan-Finch man is backed by his company's 90 years experience in the lubrication field. You can get a Swan-Finch man to look over *your* plant operations, to suggest the best cutting oils for *you*—without cost, without obligation. He takes but a short while. He won't interrupt production. Simply mail coupon below to Swan-Finch today.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Operations: Champfering and threading
Machine: Semi-Automatic
Stock: Pre-cut bar (SAE 1112)
PARTS PER TOOL GRIND: With original cutting oil: 500
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EXTRA Benefits: Dull threads, occasionally present with original cutting oil, completely eliminated. Smoother finishes on parts produced.

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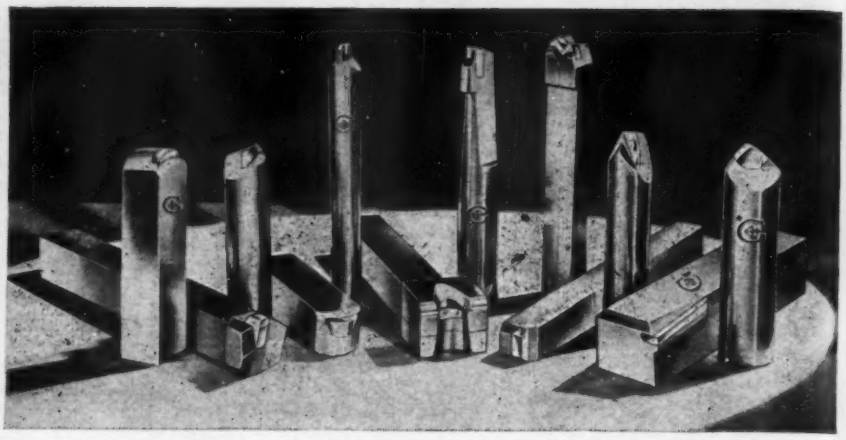

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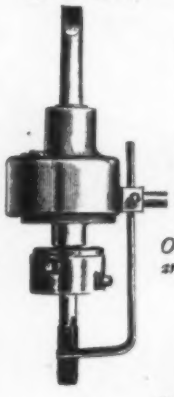
Size	Tap Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" ⅜"
" 0	¼" ½"
" 1	⅜" ¾"
" 2	⅛" 1 "
" 3	⅜" 1¼"
" 4	½" 1½"
" 5	¾" 2 "



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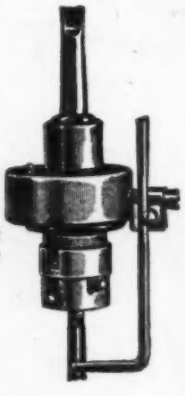

Style B Positive Stop Holds Work Down

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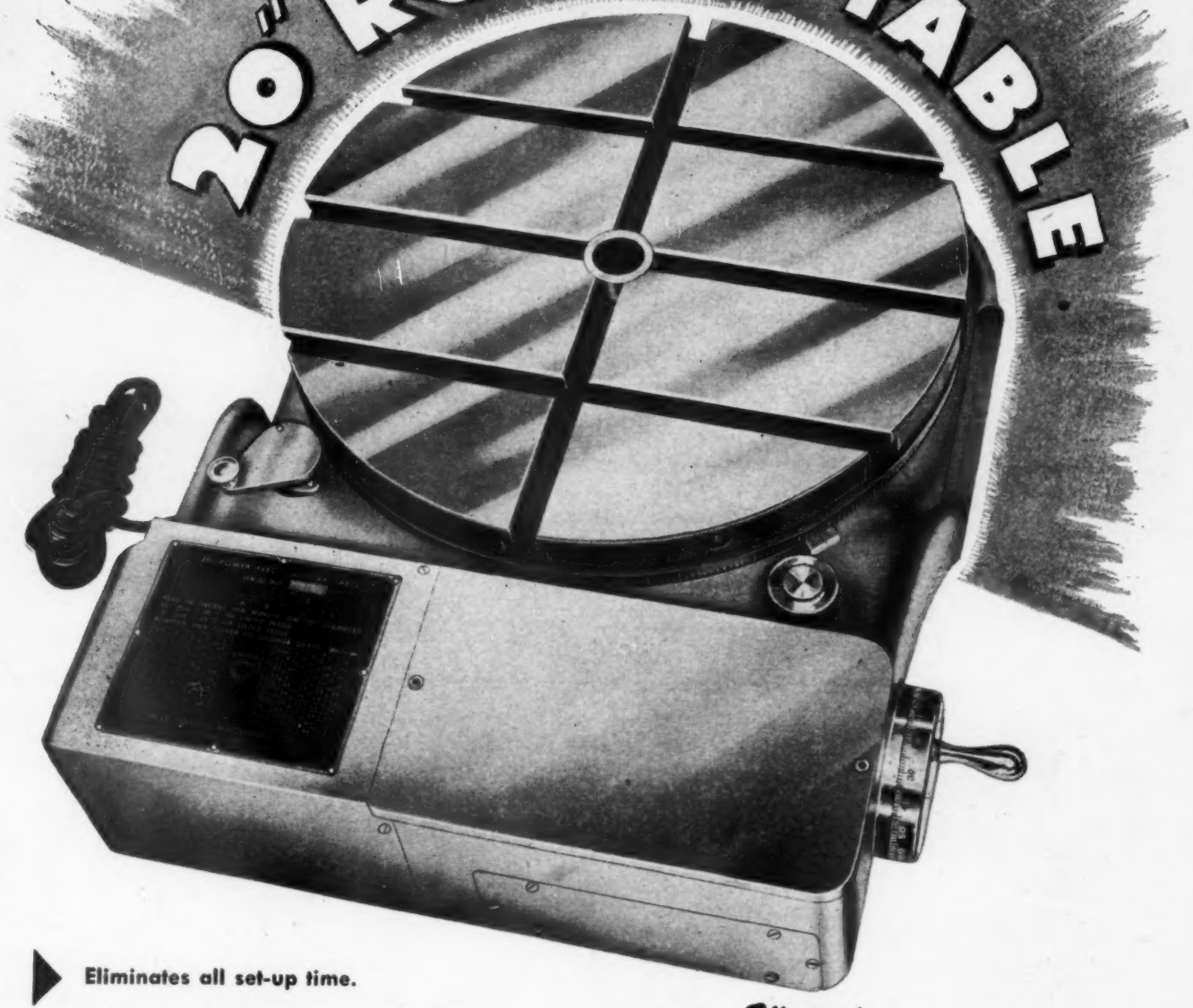

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- May be used on any make of milling machine or horizontal boring mill.
- Plug it into the nearest light socket and it's ready to go.

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for free, accurate thread cutting in deep holes

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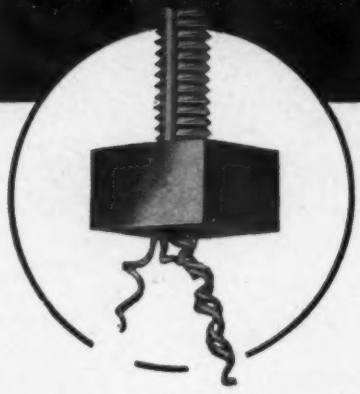
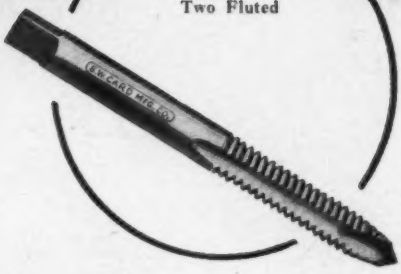


Two Fluted



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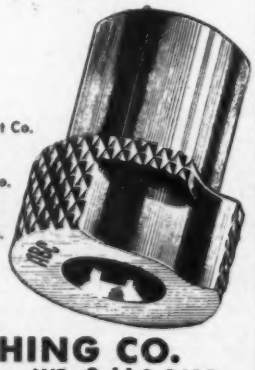

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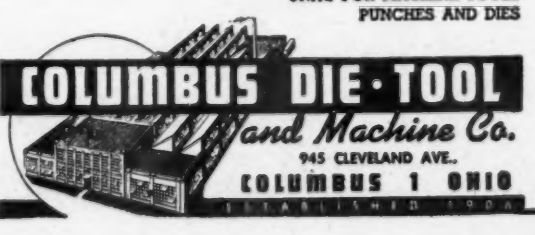

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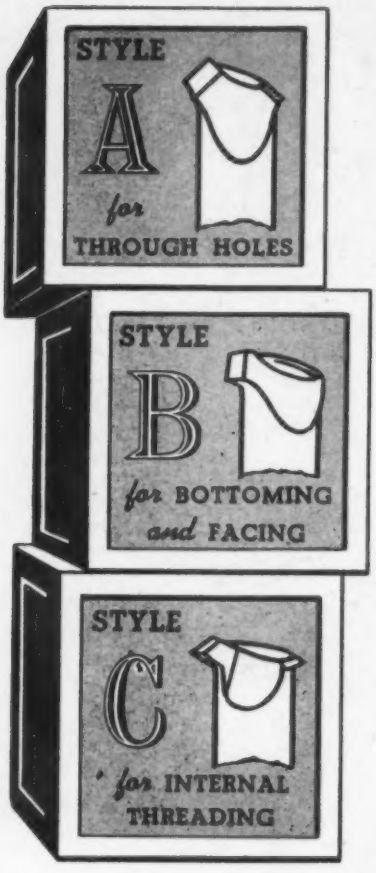

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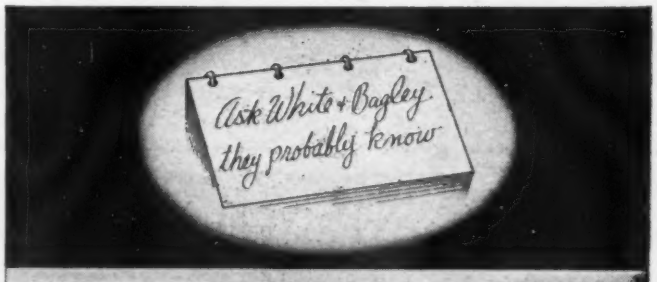

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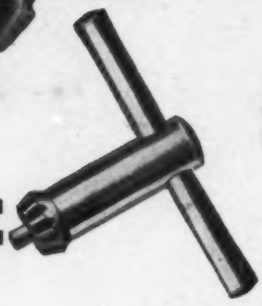

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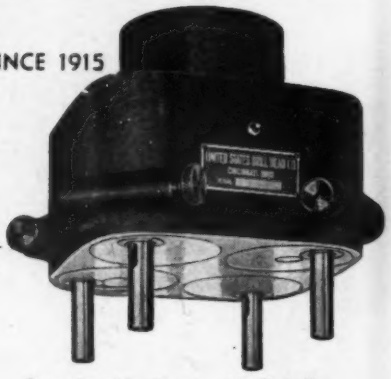

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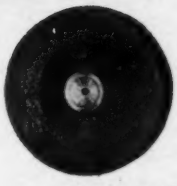

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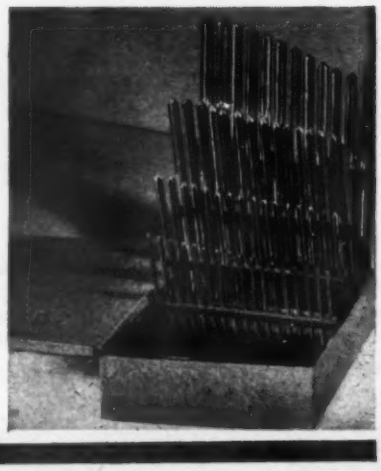

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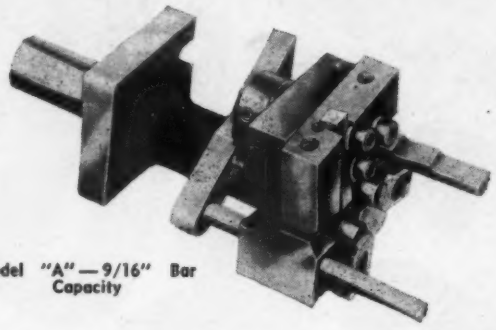

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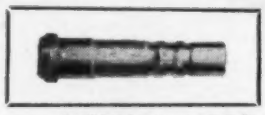

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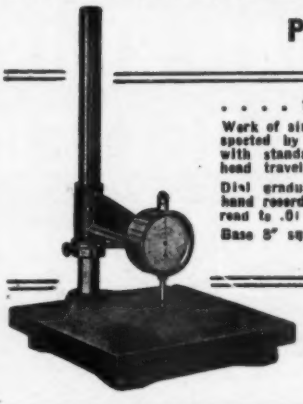

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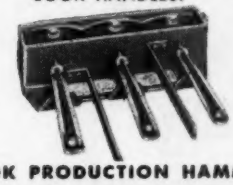

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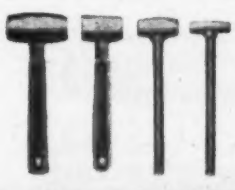

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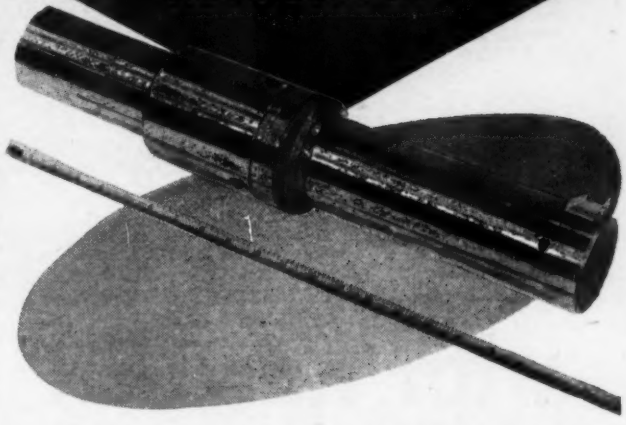

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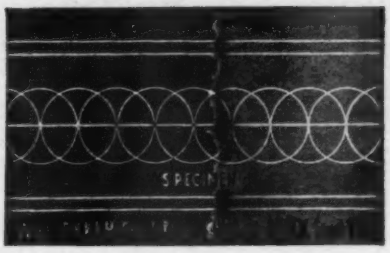

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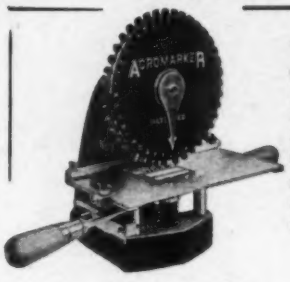

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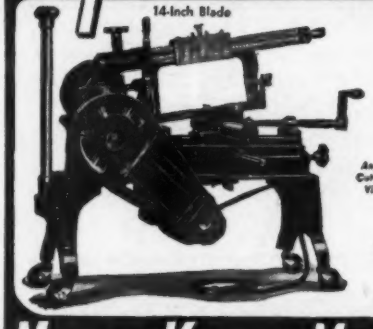

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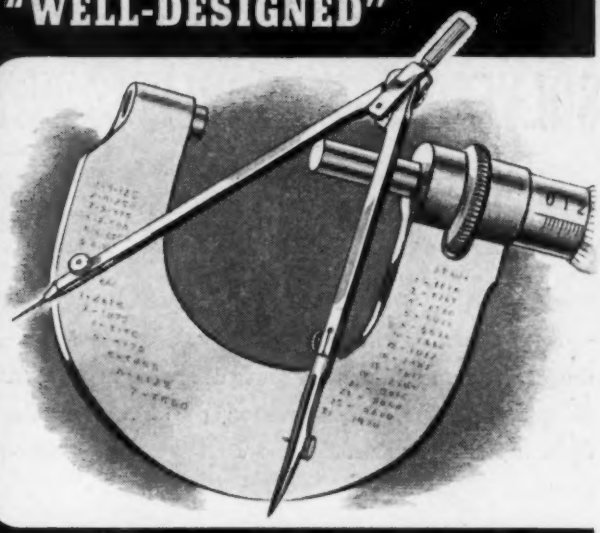

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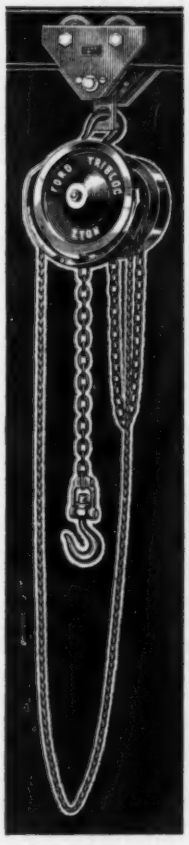

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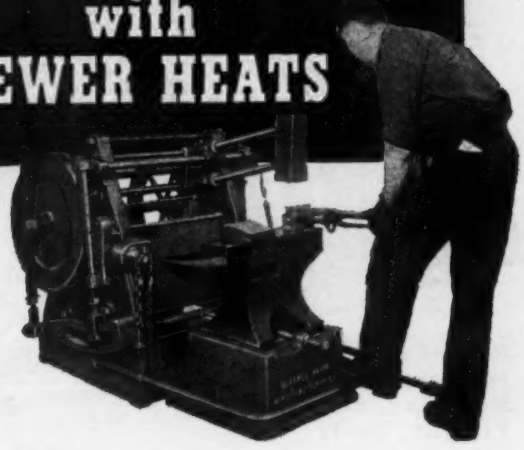

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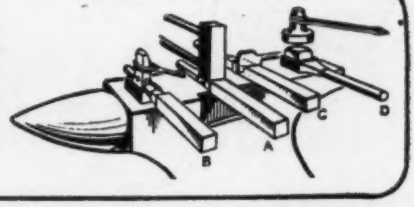

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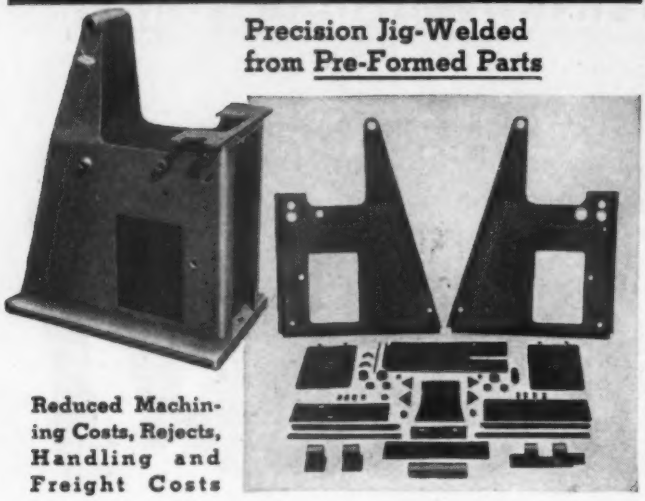

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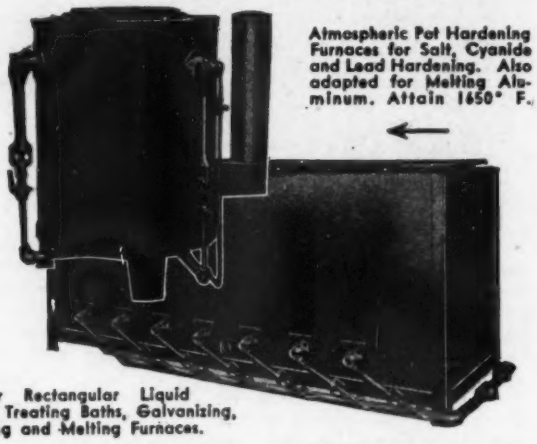

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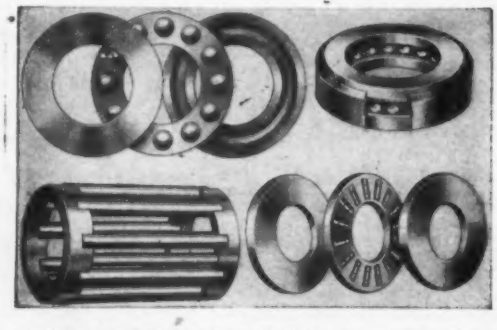

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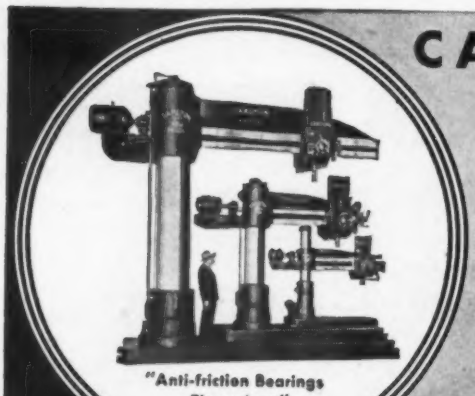

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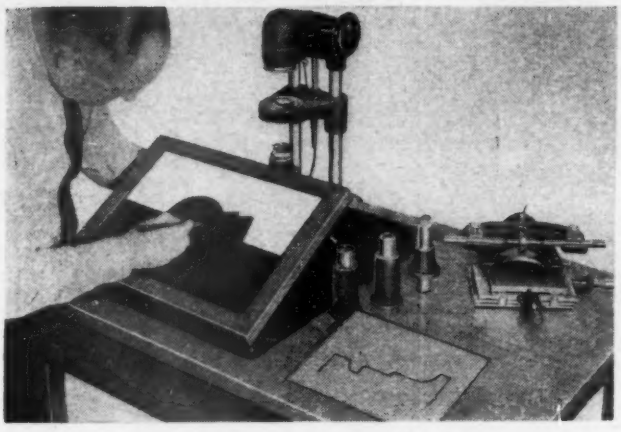

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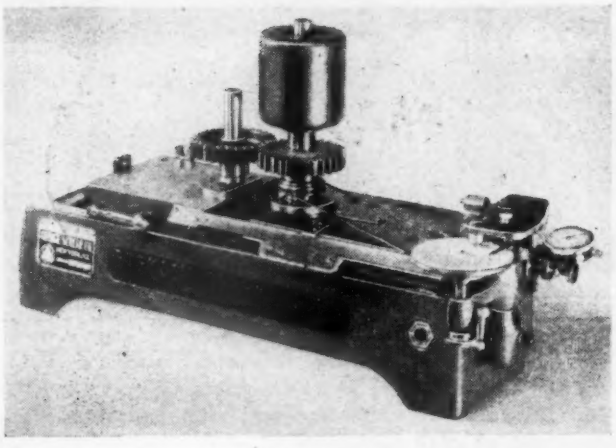

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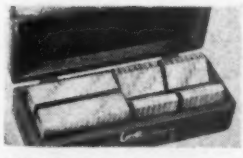

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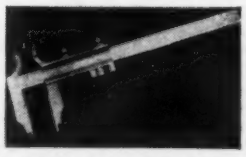

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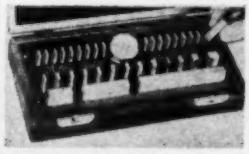

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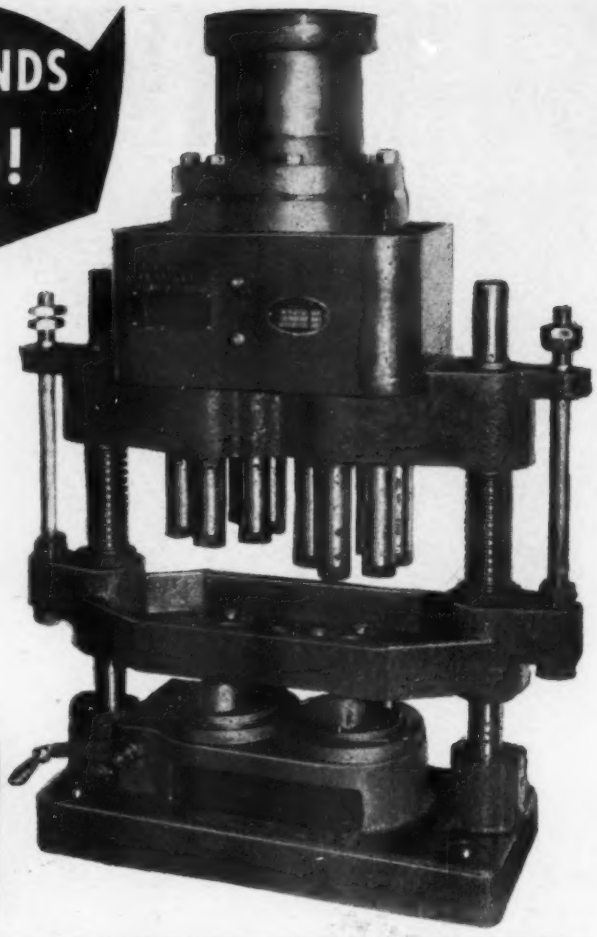

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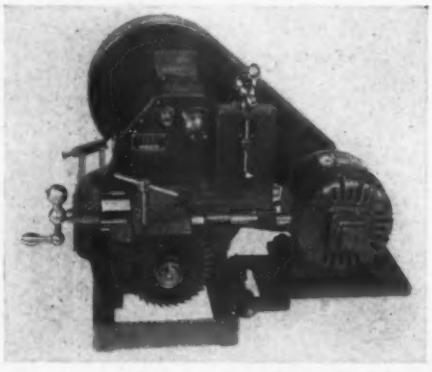

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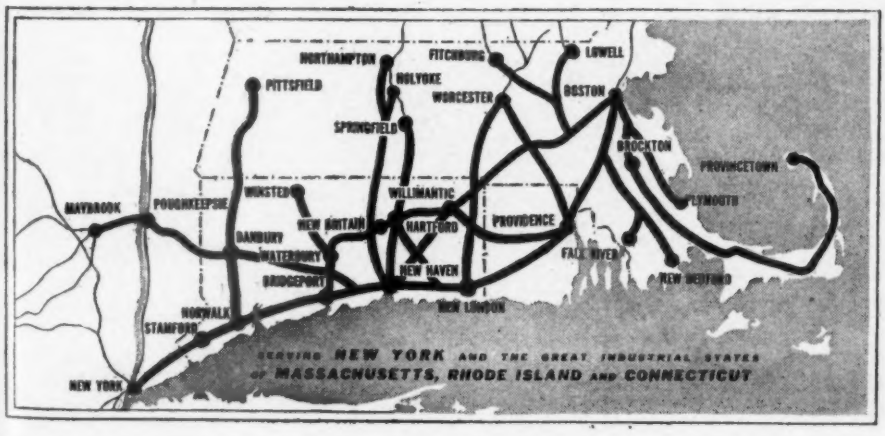

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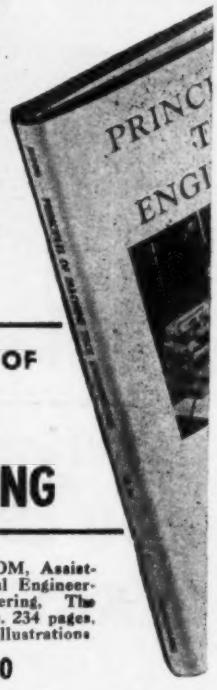

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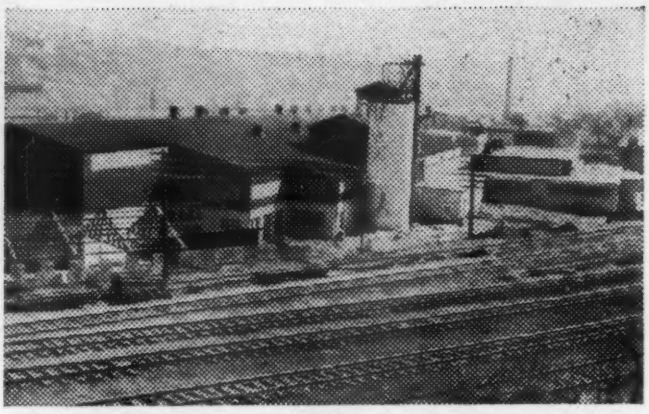

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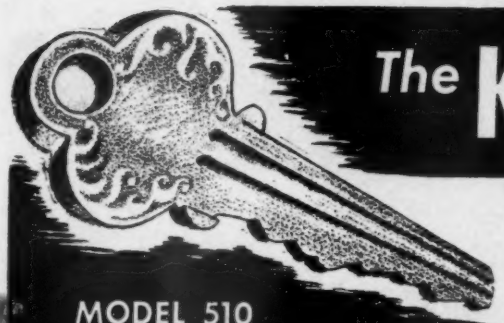

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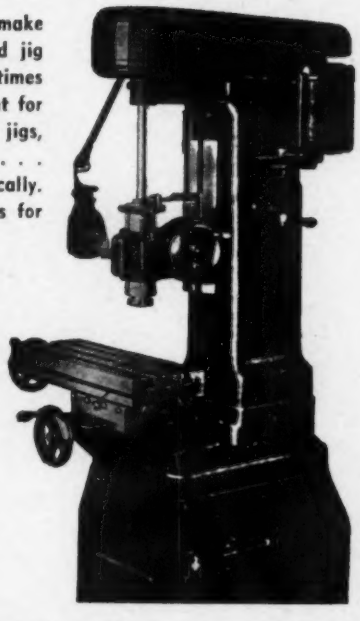

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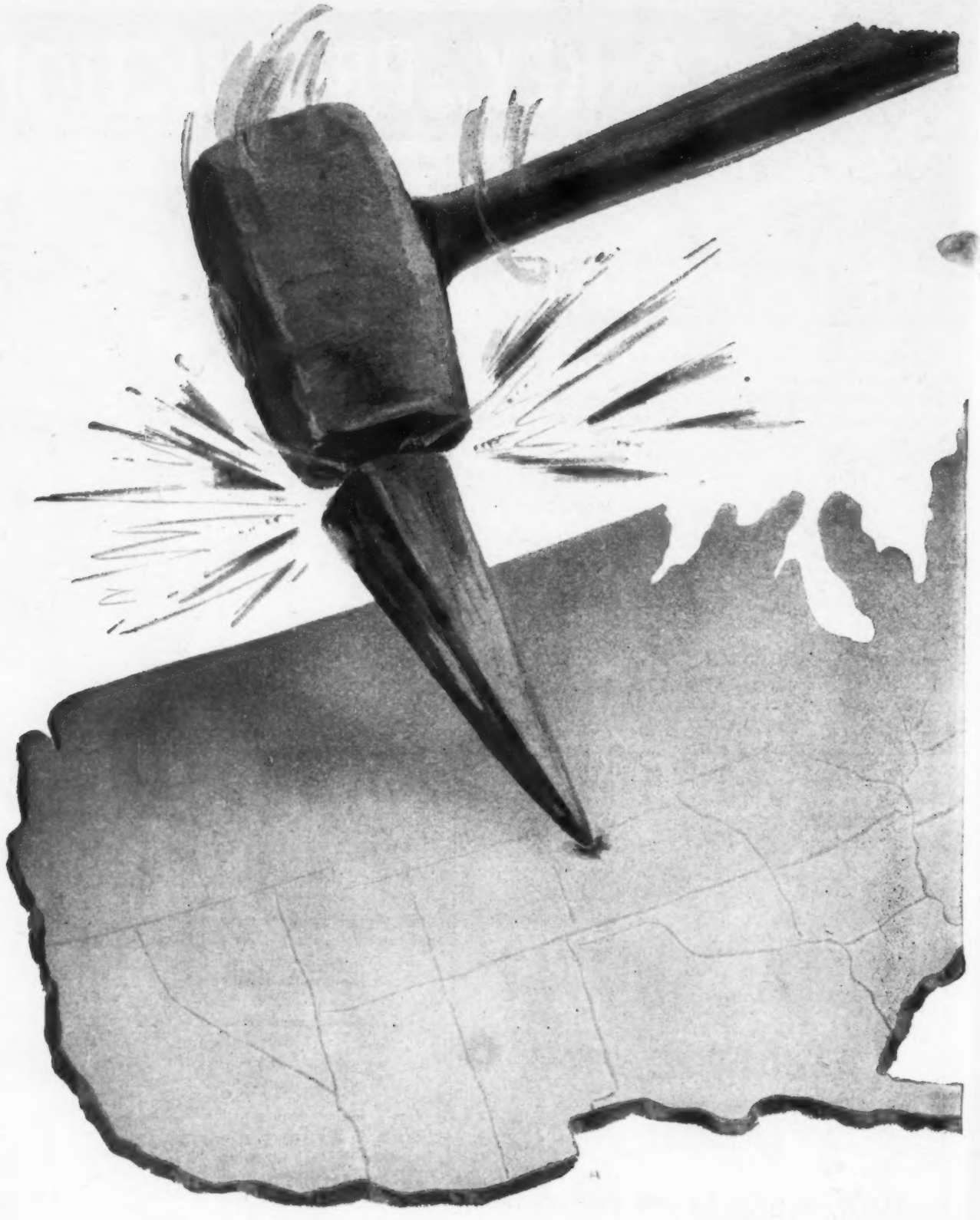

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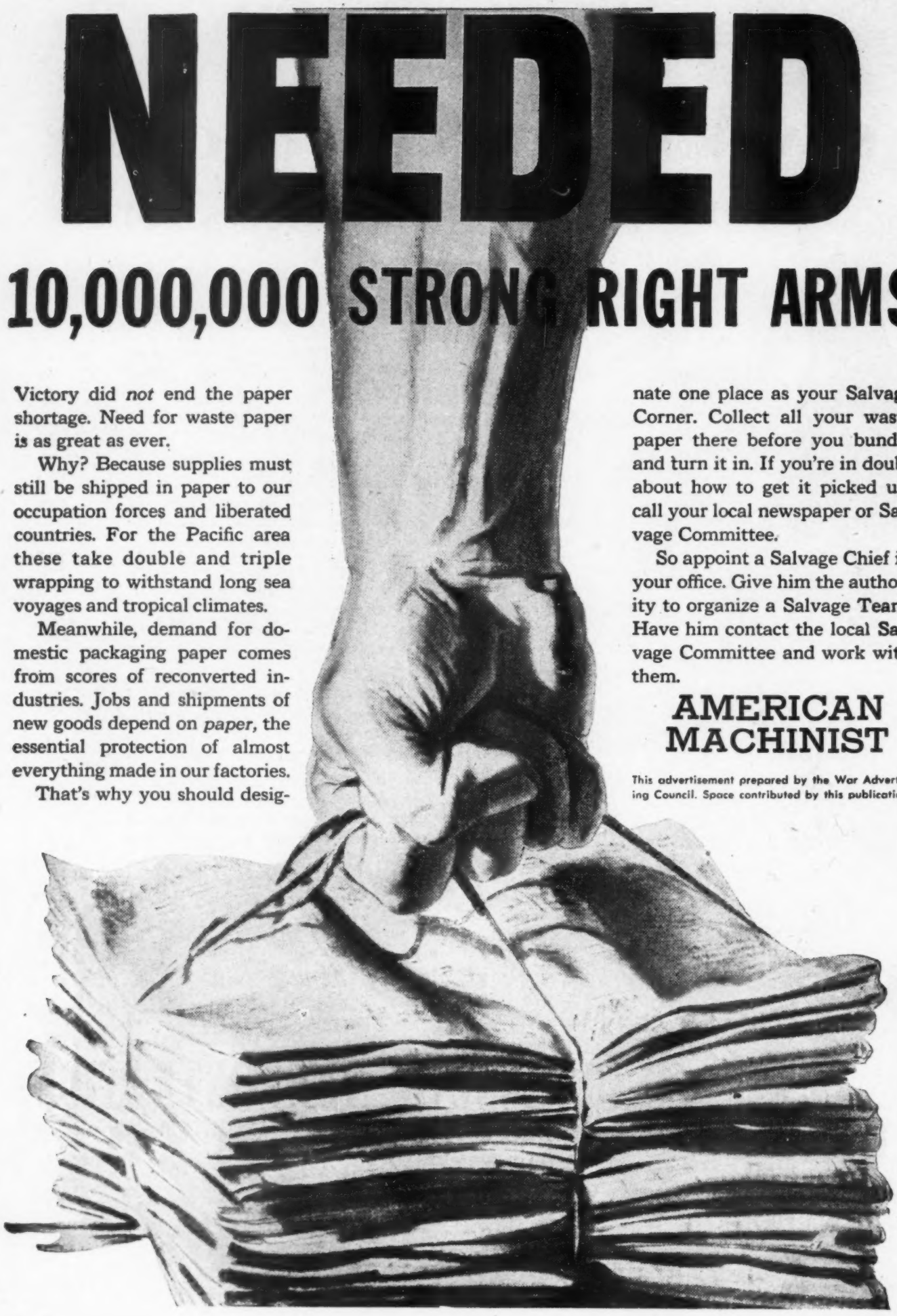

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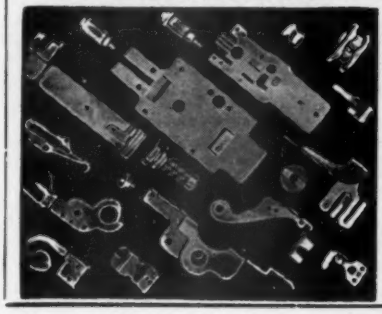

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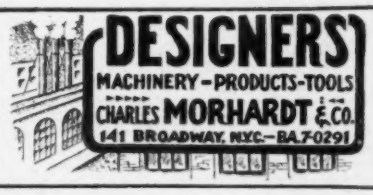

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Hundreds of metal-working companies are finding profitable business today *outside* their regular lines. You, too, can put your idle machines and equipment to good use by directing attention to them through American Machinist's CONTRACT WORK SECTION.

American Machinist's net paid circulation of over 26,000 reaches the men who need and can authorize sub-contracting. Tell your story to these men through American Machinist's CONTRACT WORK SECTION. We will gladly send you complete information at no obligation.

***Contract Work Department* AMERICAN MACHINIST**

330 WEST 42nd ST., NEW YORK 18, N. Y.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

10 CENTS A WORD, MINIMUM CHARGE $2.00
Positions Wanted (full or part time individual salaried employment only) ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements. The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

POSITIONS VACANT

WANTED: ASSISTANT Plant Manager, age 35 to 45, with Merchanical and Electrical Engineering background, to assist in the operation of a plant producing steel sheet and strip products. Applicants should give education and experience in detail, and state present and expected salary. Location Eastern Ohio. P-782, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FACTORY SUPERINTENDENT: for non-ferrous wire plant in New Jersey—300 employees, one experienced in handling men, mechanically trained and cost minded, under 50 years of age. Salary and bonus. Reply, giving full experience, replies treated in confidence. Experience in casting, rolling and drawing would be helpful. P-784, American Machinist, 330 W. 42nd St. New York 18, N.Y.

WANTED: ASSISTANT Shop Manager for a plant doing general repair work of heavy construction equipment and building new equipment; must be a competent machinist and familiar with modern welding techniques and shop practices. Age 35 to 45. Applicants should give education and experience in detail, and state present and expected salary. Location near New York City. P-783, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on preliminary negotiations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 226 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

ENGINEERING EXECUTIVE: 45, now heading design and research for nationally known manufacturer of gear cutting machines and allied equipment, wishes to change to a position where engineering and production responsibility will be entirely under his control. Past record demonstrates skill and ability to meet exacting requirements in engineering and management. Salary $12,000. PW-770, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION MACHINE Shop foreman, age 45, is seeking employment with an established manufacturing firm. For the past twenty-five years I have had experience with automatic screw machines, turrets, drill pressers, mill machines, etc. During that time I have handled male and female help and studied methods, have made incentive system work, and have worked hand in hand with labor and management. Working at present as foreman. Would prefer to be established in a firm which is located in New York City or Brooklyn. Will also consider an out-of-town position. For further information in reference to my capability write to PW-785, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION EXECUTIVE: under 30, with background in economics and industrial engineering; eight years' experience in production organization and management, methods, costs, quality control, time and motion study, etc., in metals, machinery, and radio components, looks for connection with future. Languages for foreign position. PW-786, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINIST AND Toolmaker. 25 years' experience on small, medium, and large precise work, desires connection with small progressive concern in supervisory capacity. PW-788, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

SPECALIZED FIRM in the line of measure, research and control instruments for Metal Working Industries as well as for precision machine tools, desires to enter in relation with important American firms to represent them on the Italian market. RA-787, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATION OR Sales follow-up for out-of-town manufacturers of machinery, small tools and gages, parts, apparatus and equipment in New York City area solicited by an engineering firm capable of providing installation, engineering and specialized personnel necessary. All inquiries welcome. RA-747, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ESTABLISHED IMPORT & export firm located in Shanghai, China desires additional connection with leading manufacturers. References furnished. Address: Ray Snyder, c/o Dean Company, 26 O'Farrell Street, San Francisco 8, California.

BUSINESS OPPORTUNITY

MECHANICAL ENGINEER: 20 years shop, design, and sales experience; wishes to invest $15-20,000 and services in small going manufacturing shop. BO-748, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS—U. S. and Foreign Patents secured. Trade-marks and copyrights registered. Searches made to determine Patentability and Validity. Patent, Trade-mark and Unfair Competition Causes. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th St., N.W., Washington 5, D. C.

Electrical Engineering Opportunity

Electrical manufacturer of nationally known motor control and power distribution equipment is interviewing candidates for a student engineering course directed toward headquarters application and field engineering work of permanent nature and with excellent poportunity for advancement.

Men selected must have engineering degree, sales aptitude, intelligence, initiative and be within 21-30 year age bracket. Give full particulars.

P-778, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MANAGER WANTED FOR SMALL TOOL DIVISION

of old established business.

Must have experience and ability to take charge of engineering, sales and manufacture and to expand and add new lines.

Company has highest rating. Plant is modern, has progressive policies and congenial working conditions. Location in attractive residential section of upper New York State.

Unusual opportunity and future for the right man.

Applications will be considered in confidence and should give particulars as to qualifications and experience, age, references, compensation, etc.

P-761, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

MECHANICAL ENGINEER

With extensive practical experience for a gear manufacturing plant; one whose experience has brought him into contact with cost reduction by means of designing of special tools and fixtures to step-up manufacturing procedures. Must be wide awake with past earnings approximating $10,000. State full particulars including educational background, names and addresses of former employers.

P-767, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

ENGINEER TO DIRECT PRODUCTION

Graduate engineer, or equivalent, with practical production experience wanted to direct manufacturing activities of medium-sized East Coast concern specializing in precision equipment sold in the aircraft and industrial fields. Man desired should be capable of coordinating engineering development with production requirements; also of coordinating production control, tool design, costing, etc. New York City vicinity. Salary commensurate with experience.

P-777, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

First Class Mechanic Wanted

To take charge of Metal Furniture Plant. Willing to go South. Must be thoroughly familiar with laying out dies. Write giving experience, salary, etc.

P-763, AMERICAN MACHINIST
330 WEST 42nd STREET, New York 18, N. Y.

Contract Work Available

WANTED

A MFR. equipped to produce line of machines ranging in weight from 10,000 lbs. to 50,000 lbs. each.

CWA-781, AMERICAN MACHINIST
330 WEST 42nd ST., NEW YORK 18, N. Y.

WANTED — SALES MANAGER

Experienced: Sales of Machine Tools, Metal Fabricating Equipment. Sales Promotion, organize territories, quotas, systems, reports, customer correspondence, engineering Sales letters. Assume direct charge of Salesmen.

An excellent opportunity with a Chicago concern for an aggressively active Sales organizer and Manager.

SW-779, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL SUPERINTENDENT

Experienced 8 years in responsible supervisory capacity as Mechanical Superintendent, Tool Room Foreman, Chief Tool Designer and Press Room Foreman. Total 22 years experience Tool & Diemaker, Tool Designer, Machinist. Age 38. Wishes change to Mid or Far West Location. Minimum starting salary $7000.

PW-780, AMERICAN MACHINIST
330 West 42 St., New York 18, New York

LARGE STOCK OF NEW & USED COLLETS

Also—Feed Fingers—Pads—Threading Equipment & Parts—Double Deck Tool Holders—Cams.
R. A. 6 Gridley Automatics—1¼", 1⅜", 1⅝", 2⅜".
Mod. 60 & 61 New Britain—Namco Die Heads.
Collets for Gridley Model F, ¾, ⅞", 1¼, 1⅜, 1¾, 2¼, 2⅝, Automatic Mach.
Extra large stock of 2⅜" R.A. 6 Gridley parts and collets.

We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

GRAFF MACHINE TOOL COMPANY
7139 So. Halsted Street *Vincennes 9664* **Chicago 21, Ill.**

HOKE PATENTS

Notable offering of Patents of the late William E. Hoke, inventor of Hoke Precision gages, Magnaflux, etc.

Methods, art and apparatus for lapping fuel pumps and injection nozzles for Diesels (includes lapping and/or abrading of tools, the art of lapping and abrading, and apparatus.

ALSO methods and systems for lapping cylinders, cones and taper-rollers, taper-roller lapping devices, roller bearings.

MRS. W. E. HOKE
1405 Cold Spring Lane, Baltimore 9, Md.

THREAD GAGES—PLUG AND RING

Slightly used, NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.
Send For Our Bargain Circular

7" AJAX FORGING MACHINE

21" stroke—Strokes per min.—25
Die Dimensions: 26" deep
31" high
11" wide

In good condition—and priced to sell!

Iron & Steel Products, Inc.
13498 S. BRAINARD AVENUE
CHICAGO 33, ILLINOIS

"ANYTHING containing IRON or STEEL"

Univ. Cyl. Grinders. Landis Type L.C. 12x36". Landis Type C. 10"x24". B and S No. I 10"x24". Norton 16" Double Floor. Models 5 HP. AC.
Turret Lathes: Gisholt 3½" Cap. Quick Return. J and L 3" Cap. 3x36. Saddle Type.
Engine Lathes. Monarch 6x16", Geared Head. AC 3 HP. Motor. Draw Bar, 29 Collets. Push Button Control. New Cross Travel Screw, and Clutch Adjuster. Good Condition.
Higley 21" Undercut Cold Saw No. 9 Complete. Sellers drill Grinder. Cap. 2½". Several Drill Presses to 3" Cap.
2 Mariville Blanking and Perforating Arch Type Presses 16" and 12" between uprights. ⅝ Stroke. Auto roller feeds.

JAY SALTER
306 Rosedale St. Rochester, N. Y.

LATHE FOR SALE

4 Seneca Lathes; 5" swing; 28" bed; with AC 16" swing; 24" bed; very reasonable. Also other surplus items for sale. *Write for details.*

BABCOCK PRINTING PRESS CORP.
38 PEQUOT AVE., NEW LONDON, CONN.

GRINDER

Sheffield Micro-form Grinder complete with circular grinding attachment. Used 2 to 3 months. Price $6,500.00.

FS-764, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

MDNA MEMBER

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

WANTED

Brown & Sharpe No. 2 vertical miller and die sinker, geared head single pulley drive, complete factory equipment.

Brown & Sharpe No. 1½ B plain miller, complete including new dividing head, swivel vise and arbor, geared head single pulley drive. Rebuilt to their original accuracy, 30-day guarantee.

SMITH MACHINE TOOL CO.
Spencer & Jackson Sts.
Albany 4, N. Y. P. O. Box 1381

FOR SALE
GORTON 8-D

Vertical Miller with power feed and Universal Dividing Head, motorized for 220/440/3/60. Excellent Condition.

R. BRONSON
142-18 230 PLACE, ROSEDALE 10, N. Y.

WANTED TO BUY

Several multiple spindle drill presses with a #2 Morse Taper. Can use 3-, 4-, or 6-spindle and require a total of 25 spindles.

Columbus Production Mfg. Co.
249 East 5th Avenue Columbus 1, Ohio

5" AJAX UPSETTER, M. D.

AARON MACHINERY CO., INC.
45 Crosby Street New York, N. Y.

WANTED

Nail Header that will handle ⅛" x Dia. x 2" Stock.

JOHN ROBINSON
530 N. Taggart Ave., Clarksville, Ind.

IN STOCK

LATHES

8"x108" Fitchburg Lo-Swing
12"x18" Lipe Carbo
13"x6' Sebastian Grd. Hd.
18"x6' American Grd. Hd.
20"x10' Lodge & Shipley Grd. Hd.
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head

MILLING MACHINES

No. 2H Milwaukee Vertical, latest type
#3 Milwaukee Vert. M.D.
#3K Milwaukee Vert.
#3 B. & S. Plain, M.D.
No. 4 Cincinnati Plain, Motor Drive
No. 4K Milwaukee Plain Late Type
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
Pratt & Whitney Spline
No. 27MB Smalley General Thread
#2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x14' Ingersoll Adjustable Rail, four heads

VERT. BOR. MILLS

34" King, s.p.d.
42" Bullard New Era Vertical Turret
72" Colburn, Motor Drive
72" King Motor Drive

HOR. BOR. MACHINES

No. 50 Universal, 5" Bar, 60x144" Table, Maximum Bar to Table 72", Maximum Bar to Outboard 120".

GEAR HOBBERS

No. 4 Pfauter, 72" Capacity

PLANERS

36"x36"x8' Woodward & Powell
60"x38"x8' Gray Spiral Geared

TURRET LATHES

#3 W & S Univ. Bar Feed
#4 W & S Univ. Speed Selector
No. 1-A W & S Univ. Speed Selector
#4—W & S 1½" Screw Machine
#6—W & S 2" Screw Machine
6.2" Denver Chucking
#6.R Denver Univ. 2-9/16 Cap.
18" Libby—3½" Hole—M.D.

AUTOMATICS

1⅝" Conomatic, 8 spdl.

GRINDERS

6"x18" Norton Hydraulic Plain
6"x30" Norton Hydraulic Plain
23"x36" Norton Plain, M.D.
14"x168" Norton Plain, Late Type
#22—12" Heald Rotary Surface
23"x36" Norton High Swing
10"x24" Landis Universal, M.D.
No. 16 Blanchard Surface
No. 2 Brown & Sharpe Surface

HILL-CLARKE

MODERNIZED & MOTORIZED CYLINDRICAL GRINDERS

SIZES AVAILABLE

10x18	14x36	16x 50
10x36	14x50	16x 72
10x50	14x72	18x 96
10x72	14x96	24x 96
10x96	16-24x50 Gap	24x240

HILL-CLARKE MACHINERY COMPANY
651 Washington Boulevard
Chicago 6, Illinois

KEEP POSTED

ON BOTWINIK QUALITY USED AND REBUILT MACHINE TOOLS FOR MORE PROFITABLE PRODUCTION

1—Putnam 84"x84"x40' Dbl. Hous. Planer, Revers., M.D., and controls, 2 heds. on cross rail, 2 side heds., can be inspected in operation.

2—W & S No. 3 Turret Lathes, sw. over bed 15⅜", over carr. 13¼", over cross slide 7", as good as new, very latest type, with bar equip.

3—Simmons No. 2 Micro Turret Lathes, M.D., lat. type, capac. 1¼", round, power feed to turret.

2—W. & S. Univ. Hollow Hex. Turret Lathes, M. D., Mod. 2A, bar capac. 2¼"x26", (1) Mod 1A, bar capac. 2½"x35", (1) timk. bear, spins., AC elect. equip., bar and chuck.

1—Barnes No. 242 Rec. Col., All Grd., Upright Drill and Tapper, Ser. No. D28, AC motor drive in col., 12¼" overhang, tbl. wkg. surf. 28"x 18".

1—Barnes No. 262 latest type, Sin. Spin., All Grd., Self Oiling, Squ. Col., Slid. Hed., Drill, M.D., 26" overhang, No. 5 Morse Taper

2—Leland-Gif. 14", 4 spin., power feed, Sensi., BB, Drilling Machines, M.D., coolant pump, tank and piping, tbl. wkg. surf. 47"x 14½".

3—Stand. Machine Co. No. 4A Swaging Machines, M.D., capac. 2⅛", draw. tube 1½" diam. solid, elect. equip., net wght. 2950 lbs., latest type.

Botwinik Brothers
of Mass. Inc.
3 SHERMAN ST., WORCESTER 1, MASS.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.

2 Landis ¾" Bolt Formers and Threaders, M.D.

1 National ½" to 1" Hot Bolt Head Trimmer

Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer

Cincinnati 36" x 36" x 16 ft. Planer, M.D.

1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

CLOSEOUTS

BORING MILLS

HORIZONTAL

2½", 4" Binsee

VERTICAL

66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme 3¼" M.D.
No. 1L Gisholt Univ. M.D.

Hilles & Jones Straightening Rolls 6' wide by ½" cap. plate, M.D. with controls, practically new.

GRINDERS

P. & W. 14", 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M. D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless, M.D.
B. & S. No. 1, 3 Universal
#25, #55 G. & L. M.D.

LATHES

McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey Grd. Hd.
9" LeBlond Automatic
36x30' Putnam M|D.
36x22" Putnam, S.C.G., D.C. M.D.
32"x26' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, Hand Screw
B. & S. No. 0
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New In Stock

5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws

RADIALS

4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4' 5' Western, S.P.D.
4' American Hole Wizard, M.D.

MILLING MACHINES

Cincinnati, #2 Univ.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
K. & T., B. & S., No. 2, 3 like new
B. & S. No. 2, 3, Vert.
Kempsmith No. 1 Univ.
No. 8D, 8½D Gorton Vertical, M.D.
#3 Van Norman Universal
#2 Conradson Universal

MISCELLANEOUS

Gorton No. 1S, 3U, 3Z Engraving Machine
6 spindle Avey Drill, 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
10x10 Peerless Universal Shaping Saw
#7, 7½ Fellows Gear Shapers
No. 8 Marvel Band Saw, M.D.

AARON MACHINERY CO., INC.
45 Crosby St.
New York 12, N. Y.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

1—#00 Brown & Sharpe Full Automatic, Standard Speed
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅝" 4-spindle Automatics, complete
2—3¾" Cleveland Model A.
1—#1 Brown & Sharpe Standard Speed, Belt Drive, Full Automatic (same size as #2).
1—#2G Brown & Sharpe Full Automatic, serial #5396.

LATHES

Logan Q.C.G. Lathes (new).
Sebastian Engine Lathes (new).
14" x 20' Hendey Toolmakers Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 10' American, Geared Head, Taper.
20" x 10' Hendey with Taper.
24" x 20' American, Motor drive.
48" x 30' Simmons Geared Head, 1941.
18" x 6' Chard, M.D.
14" x 6' Rockford Cone drive (two)
13" x 6' Williard, geared head
18" x 222" Hendey, M.D. (two)
20" x 11' Schumacher-Boye, M.D.
14" x 6' Hendey Yoke Head
28" x 10' Davis cone driven

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)

TURRET PUNCHES

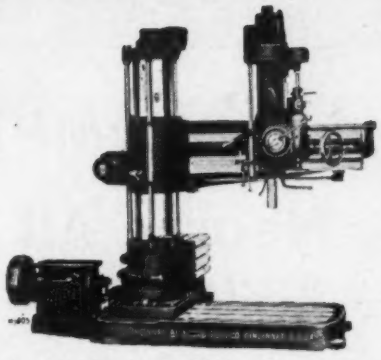
Hecker, vertical type, 8-station, air operated, 18" throat.

PLANERS

20" x 20" x 24" N.-B.-P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.

SHEARS & METAL WORKING

Lennox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.



Gould & Eberhardt Slitting Shear, 10 ga. Niagara 48" Roller Leveller, 6 Rolls.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#3B Hendey Universal Miller, motor drive.
Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.
#4 Cincinnati Vertical High Power Miller. (2)

#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

RADIAL DRILLS

4' Arm, 11" Column Cincinnati-Bickford.
5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.

GRINDERS

Queen City Dble. End Grinders, motor driven (new).
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole; 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.

BORING MILLS

100" Niles-Bement-Pond, 2-head geared motor drive.
72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new).
#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed. 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
Hilles & Jones #5 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

1—24" Gould & Eberhardt Backgeared Crank Shaper, M.D.
#1 Adams Gear Hobbers, Belt driven (3).
24" American Direct Motor Drive.
15" Potter & Johnson, Universal Knee.
Slotter 12" stroke New Haven, motor drive.
Rhodes 7" stroke, Shaper.

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat, 1/60/440 volt
Thomson Cutter and Creaser, 12½x18½.
Heat Treating Furnaces for the tool room.

120" x 96" x 24' **Simmons Heavy Duty Double Housing Planer.** Complete with 4 heads and standard equipment, arranged for reversing motor drive and rapid traverse and including one Reliance 50 HP, 150/900 RPM D.C. motor, frame P-4617, 230 volts serial #644739, one Cutler Hammer control Box #B-871007A7.

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Machinery Merchants

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MOREY DEPENDABLE

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AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER No. B2 Dimatic Automatic, latest type
CLEVELAND ⅞" to 2½" Model A
CONOMATIC 3½" 4 spindle—latest type
NATIONAL ACME 9/16" model C, 5 spindle, M.D.
NEW BRITAIN-GRIDLEY #65, 6 spdle; chucking; latest type

BORING MILLS—Horizontal

FRANKLIN 4½" bar, single pulley drive
GIDDINGS & LEWIS #25 2½" bar, M.D.
LUCAS #31—3" bar—motor drive
NILES BEMENT POND 5½" bar—M.D.
NILES BEMENT POND 4½" bar—floor type—M.D.
NILES BEMENT POND 5" bar—floor type—M.D.
NILES BEMENT POND 6" bar—floor type—M.D.
NILES BEMENT POND 7" bar—floor type—M.D.
OHIO #5F-420 5" bar Floor type, latest type
P & H #10—3½" bar—floor type—M.D.
PETRICK 3½" bar, floor type, M.D.

BORING MILLS—Vertical

BETTS 120"—2 swivel heads, motor drive
BULLARD 24", 36", 42" New Era Type M.D.
BULLARD 86"—2 swivel heads—motor drive
COLBURN 72' 2 swivel heads, AC, M.D.
KING 30" Vert., M.D.
KING 72" 3 heads, AC, M.D., Latest type
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 42"—2 swivel heads; power rapid traverse
NILES 73"; 2 swivel heads; AC; M.D.
NILES BEMENT POND—100" two swivel heads, PRT Motor Drive

DRILLS

ALLEN #2, 2-4 spindles, latest type
BAKER #121 Single spindle—latest type
BAUSH #2, #3, Multiple spindle, M.D.
BODINE No. 42 20 Auto.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND No. 1B, single spindle, M.D.
EDLUND No. 2MS, 2 spindle, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
NATCO C-13H multiple spindle
PRATT & WHITNEY No. ½8x50" 2 spdle. Deep Hole—latest type

DRILLS—RADIAL

AMERICAN 3'11", 5'11", latest type
AMERICAN 4'11", 5'11", 5'13" triple geared, AC, M.D.
AMERICAN 5'13" Uni. triple geared, AC, M.D.
BICKFORD 4'11", 5'11", 5'13", AC., M.D.
CANEDY OTTO 3'11" New
CARLTON 3'11", 6'17", 6'19", 7'19"—latest type
CARLTON 5'14", 7'15"; M.D.
CINCINNATI BICKFORD 4'11", plain, M.D.
CINCINNATI BICKFORD 6'19", Super Service, M.D., latest type
DRESES 4'13", 5'15", AC, M.D.
FOSDICK 5'14" AC, M.D.
MORRIS 4'11", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
REED PRENTICE 4', 6', AC, M.D.
RYERSON 4'11" AC, M.D.
WESTERN 3' single pulley drive
WESTERN 4'18"; 5'18"; 6'20"—latest type

Nearly All Built After 1941

GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 3 Gear Hobber
BARBER COLMAN #12 hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
BROWN & SHARPE No. 13 Gear Cutter
BROWN & SHARPE No. 6 x 60 Gear Cutter
BROWN & SHARPE No. 44 Gear Hobber
CINCINNATI Gear Burnisher
FELLOWS #7, #7A, 72, 77 gear shaper
FELLOWS 624A, gear shaper, latest type
GLEASON #13 tester, M.D.
GLEASON 24" Bevel Gear Planer
GLEASON 18" bevel gear generator
GLEASON bevel gear tester and lapper, M.D.
G & E #36B Gear Cutter; Spur & Bevel, M.D.
G & E #96H Gear Hobber, with differential
MICHIGAN #854 Gear Finisher—latest type

GRINDERS—Cylindrical—Plain and Universal

BROWN & SHARPE #1, #3, #4, Uni., M.D. latest type
BROWN & SHARPE #3 univ., M.D.
BROWN & SHARPE No. 5 Plain, M.D.—latest
CINCINNATI 12"x30" Univ., HYD., latest type
CINCINNATI 12x48 Universal Hyd., latest type
LANDIS 6x20 Plain—motor drive
LANDIS 6x18 plain, M.D.
LANDIS 12x36 Universal Type LC Hydraulic; latest type
LANDIS 12x64 Universal—motor drive
NORTON 10x18 plain, M.D.
NORTON 10"x36 Type C Plain HYD., latest type
NORTON 14x48 Univ. Type C Multi-purpose HYD., latest type

GRINDERS—Internal, Cutter and MISCELLANEOUS

BRIDGEPORT 18x110 face and knife
BROWN & SHARPE #13, Uni., and tool, M.D.
BRYANT #6 internal, M.D.
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 internal, hyd., latest type
CINCINNATI #2 Plain Tool & Cutter—latest
FITCHBURG Uni. spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD No. 70—Internal—motor drive
HEALD 72A3 Sizematic Internal, latest type
HEALD No. 81—Plain Internal—latest type
HEALD 72A5 Plain internal dial type, latest type
LEBLOND #2 uni., tool and cutter, latest type
OLIVER Univ. and Tool—latest type
OLIVER #510 drill, latest type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #1 tool cutter
SELLERS #2 uni., tool cutter
SELLERS #4T Univ. tool—latest type

GRINDERS—Surface

ABRASIVE 1½, latest type
ABRASIVE #3 22x8x12, M.D.
ARTER, 8" Rotary Surface
ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #16—26" Chuck—motor drive
BLANCHARD No. 18—30" Chuck—latest type
MATTISON 16x24x96—Hydraulic—latest type
MATTISON 20x24x72—Hydraulic—latest type
NORTON 10x60—Hydraulic—latest type

LATHES—Engine & Mfg.

AMERICAN 36"x25' centers, Timken Bearing, 2 carriages, taper attachment, latest type
AXELSON 24"x72" centers—Timken Bearing—latest type
BRIDGEFORD 36"x28'; 36"x32'; 36"x35', bed—2 carriages
BRIDGEFORD 42"x35' Bed—2 Carriages—M.D.
HARDINGE #TR 59, latest type
HENDEY—12x54 centers—Mfg.—latest type
HENDEY 20"x8' bed. Yoke head. M.D. Taper Attach.
LEBLOND 13"x4' bed—Timken Bearing—Rapid Production—latest type
LEBLOND 17"x14" bed, rapid production, Timken bearing,—latest type
LEBLOND 20"x48',centers—Timken Bearing, latest type, rapid production
LOSWING 4x34, 4x60, 8x34, 8x108, 8x60—Timken Bearing—latest type
LOSWING 10x34 Model LR Automatic, Timken Bearing, latest type
NILES 36"x24' centers, "Time Saver", Timken Bearing, 2 carriages, taper attachment, PRT, latest type
NILES 36"x25 centers, 2 carriages; PRT; Timken Bearing, latest type
NILES 48x55' centers, Timken Bearing, 2 carriages, taper attac., P.R.T., latest type
NILES 60"x10' centers, 60"x15' centers, 60"x35' centers, 60"x"40" centers, Timken Bearing, 1 or 2 carriages, taper attachment, PRT, latest type
PITTSBURGH 50'x30' bed—M.D.
RIVETT Style 918 Bench Type—ball bearing

LATHES—Turret

BARDONS & OLIVER #3 latest type
BARDONS & OLIVER No. 5, No. 7 Univ., Timken Bearing, chucking; latest type
BROWN & SHARPE #1 Hand screw machine, Timken bearing—latest type
CINCINNATI ACME #5W—Timken Bearing—latest type—2" Bar Cap.

MOREY MACHINERY

USED MACHINE TOOLS

CINCINNATI ACME #1 Universal—Timken Bearing—latest type
GISHOLT #3, #4 Univ. Timken Bearing—latest
GISHOLT #3D Simplimatics—Timken Bearing—latest type
GISHOLT #4L, 9" hole—cross sliding Turret—Timken Bearing—latest type
GISHOLT #1L, #2L, uni. Timken bearing, latest type
JONES & LAMSON #3, #5, #7C Univ.; latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY #2G, 1" cap.—Timken Bearing
MOREY #3 Univ. 1½" Cap.—Timken Bearing
MOREY #4 Univ.; 2 cap., Timken Bearing
WARNER & SWASEY #3, #4, Univ., Timken Bearing—latest type
WARNER & SWASEY No. 1A Universal, Timken Bearing, M.D.
WARNER & SWASEY #3A Universal—M.D.
WARNER & SWASEY #4A Uni. Timken bearing, latest type

MILLING MACHINES—Manufacturing

BRIGGS Type 2A Production, Hydraulic, latest type
BROWN & SHARPE #12 automatic, Timken Bearing, latest type
CINCINNATI 4-36 Hydro. Timken Bearing—latest
CINCINNATI #0-3 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI #1-12, #1-18 Plain Auto.—Timken Bearing, latest type
CINCINNATI 48" duplex, automatic, SPD
INGERSOLL 24x24x8' Planer Type—1 head
INGERSOLL 42x36x16' Planer Type—4 heads
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
KENT OWENS #1 Hand
MOREY #12M 2 spdle Profiler & Milling Machine
NICHOLS hand, M.D.—latest type
OHIO Auto. 16"x72" table—Timken Bearing—latest type—36" longitudinal feed
SUNSTRAND #33 Duplex Timken Bearing—latest type
SUNSTRAND #25 Duplex Timken Bearing—latest type

MILLING MACHINES—Plain

BROWN & SHARPE #2—Light Type—latest type
BROWN & SHARPE #2B, #3B, #4B—standard type—Timken Bearing—latest type
BROWN & SHARPE #000 Timken Bearing, latest type
BROWN & SHARPE No. 2Y, M.D.
CINCINNATI #2 Timken Bearing, dial type, latest type
CINCINNATI #5 high powered, M.D.
KEARNEY & TRECKER #2H, #2HL—Timken Bearing—latest type
KEARNEY & TRECKER #3K, Timken Bearing, latest type
KEMPSMITH #4 Maximiller—Timken Bearing—latest type

MILLING MACHINES—Universal

BROWN & SHARPE #3A Timken Bearing—dual control—latest type
ROCKFORD #2B—motorized

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, #4—Dial Type—Timken Bearing—latest type
COCHRANE BLY Universal Vertical Shaper-Miller; motor drive
KEARNEY & TRECKER #2H, #3K, Timken Bearing, latest type
REED PRENTICE #3VG—high speed—latest type

PLANERS

BELMAR 36x36x10' 2 heads, AC, M.D.
BELMAR 48x48x12' 3 heads, AC, M.D.
BICKETT 36x36x12' 3 heads, AC, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
CINCINNATI 24" Crank—motor drive
CINCINNATI 36x36x5' Box Table, PRT, 1 head—motor drive
CINCINNATI 48x48x20', 3 heads, AC, M.D.
CINCINNATI 84x72x16', HYPRO, 4 heads, variovoltage drive, latest type
CINCINNATI 120x96x20'—4 heads, box table—PRT—motor drive
CINCINNATI 36x36x8', 10', 2 heads, AC, M.D.
CINCINNATI 42x36x12', 2 heads, AC, M.D.
CINCINNATI 60x48x14' 4 heads, AC, M.D.
CLEVELAND 48x48x16' Opensides 3 heads, M.D.
DETRICK & HARVEY 48x48x10', 12' open side, 3 heads, M.D.
DETRICK & HARVEY 48x48x16' 4 heads, Hydraulic, M.D.
GRAY 36x36x8', 10' 2 heads, AC, M.D.
GRAY 44x36x12', 4 heads, AC, M.D.
GRAY 48x48x14', 4 heads, AC, M.D.
GRAY 54x42x10', 2 heads, AC, M.D.
GRAY 60x48x16', 3 heads, AC, M.D.
HAMILTON 42x42x20', 4 heads, motor drive
HAMILTON 48x48x16', 4 heads, DC, M.D.
LIBERTY 36x36x9', 3 heads, AC, M.D.
LYND FARQUHAR 26" Openside, motor drive
NBP 36x36x10', 3 heads, DC, M.D.
NBP 42x42x12', 2 heads, AC, M.D.
NBP 48x48x14', 16', 2-4 heads, AC, M.D.
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12' Time Saver, 3 heads, power rapid traverse, box table, DC, M.D., latest type
NILES BEMENT POND 96x80x20' box table 4 heads Hyd. PRT—motor drive
OHIO 36x36x10', 2 heads, AC, M.D.
OHIO 42x42x12', 2 heads, AC, M.D.
PATCH 48x48x14', 4 heads, DC, M.D.
POND 42x42x12', 2 heads, AC, M.D.
POND 48x48x16', 2 heads, AC, M.D.
PUTNAM 48x48x18', 4 heads, AC, M.D.
WOODWARD & POWELL 36x36x12', 4 heads, AC, M.D.
WOODWARD & POWELL 42x42x10', 4 heads, AC, M.D.
WOODWARD & POWELL 84x48x18', 2 heads, AC, M.D.

PRESSES

BLISS #6 Arbor Press
FERRACUTE No. DG-55 Drawing—latest type
GREENARD #6 Arbor Press
WATSON STILLMAN Hyd. Stght. Press—20 ton

SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL No. 213 Wet Abrasive Cutoff, latest type
CAMPBELL #401 Cutamatic Wet Abrasive—latest
GROB #OS-20 band, latest type
LUCAS #138 cold saw, motor driven
MAQUOKETA 10x10 hack, M.D.
MARVEL #9, 10x10 Hack; latest type
MOTCH & MERRYWEATHER #3 Cold Saw—Hyd.—latest type
PEERLESS 14x14 Hack; latest type

SHAPERS

BETTS 18" vert. slotter, DC, M.D.
CINCINNATI 28" horiz. double head
COCHRANE BLY Universal Vertical Shaper-Miller; motor drive
JONES 6" Vertical—latest type
LAMAIRE 18" Vert. Hydraulic—latest type
MOREY 10", 14" Vertical—latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
PRATT & WHITNEY 6", 10" Vertical, Motor drive
PRATT & WHITNEY 6", 12" Model B, latest type

THREAD MILLING MACHINES

MOREY SHIELDS 12x30, 12x60, 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, 6x60, 6x20, Model C—latest type
PRATT & WHITNEY 6x120, 6x132—motor drive
SMALLEY General #20, M.D.

MISCELLANEOUS

BARNES #2 SS Hone—latest type
BAUSH radial tapper ⅜"
BILLINGS & SPENCER 200, 400, 800, 1500 lbs. Board Drop Hammers
BRINELL Auto. Direct Reading Hardness Testing Machine
CLEVELAND Hob Relieving Machine
CLEVELAND 50"x10" 8 rolls leveling and straightening
COLONIAL Model HAS-25-72 Universal, Broach, horizontal, hyd., 25 ton cap.
DELAVAL Oil Clarifier
LEBLOND #2 Horiz. Hone—SS
LEBLOND #2 Deep Hole Borer; latest type
MAGNAFLUX unit #AN-724, latest type
MORTON 60" Combination Traveling head Planer, Milling & Drilling
NBP 7'x14" 6 rolls leveling and straightening
NILES 30"x50' Deep Hole Borer, Timken Bearing, latest type
PRATT & WHITNEY #3B Jig Borer
RHENBERG JACOBSEN Centering Machine
RICKET SCHAEFER #58-C, horiz. taper
SNYDER #10-V-18 Hyd. Horiz. Driller
TREADWELL 12" Pipe Threader
WHITON 8x108 Duplex Centering, M.D.
YODER Mult. Tube Cutting Machine

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IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 15 Hp motors and controls, forced feed lubrication. 21x27 bolster, 4½" stroke, 14½" shut height. In both Single and Double Action Models. Like new, no welds or no cracks. (15 available for immediate delivery.)

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10—75 ton straight side punch presses adjustable strokes, late model, motorized.

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DRILLS

28" Cincinnati Bickford, Sliding Head
32" Cincinnati Bickford, Sliding Head
6' American, Radial
4' Fosdick, Radial

GRINDERS

#2 Reid
#33 Abrasive
Model B Thompson, Hydraulic
#2 Cincinnati Centerless

LATHES

14" x 6' LeBlonde Geared Head
15" x 6' Sidney
16" x 6' Porter-McLeod, Geared Head
16" x 7' Lehman Hydratrol, Geared Head
17" x 6' LeBlonde, Taper Attachment
19" x 8' Sidney
31" x 21' American, Geared Head

MILLERS

#2 S.P. Van Norman, Plain
#2 Cincinnati, Vertical, Dial Type
#3 Cincinngti, Plain
#4 Cincinnati, Universal

TURRETS

#5 Gisholt & #3B Foster Universals
#2A & #4 Warner & Swasey

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G & E 16" & 24" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
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Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D.
& 16"x6' Lathes
American 24'x12' grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" Vert. Boring Mill
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Cincinnati 48" Auto Pl. Prod. Miller, S.P.D.
W.&S. No. 2A grd. hd. Univ.
Turret Lathe, S.P.D.
Foster No 2F Fastermatic grd.
hd. Turret Lathe, M.D.

MONA MOTORS

McDONALD MACHINERY CO.

1531-35 N. B'way., St. Louis 6, Mo.

SELECTED TOOLS

BOR. MILL, Hor. 3" Bar, Universal Triway
BOR. MILL, 36"-44" N-B-P, Tur. & Side Hds.
BOR. MILL, 42" King, Tur. & Side Hds.
BOR. MILL, 60" N-B-P, 2 heads, M.D.
BROACH MCHS., XA-Oilgear—SRV LaPointe Hyd.
GRINDER, Centerless, No. 2 Cincinnati
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton, M.D.
GRINDER, Rot. Surf., No. 25 Heald, M.D.
GRINDER, Surf., No. 2 Diamond 16x36
GRINDER, Surf., No. 16 Blanchard, M.D.
HAMMER, 1000# Board Drop, B&S
JIG BORER, No. 2 Pratt & Whitney, M.D.
LATHE, 18"x8' LeBlond, Q.C.G.
LATHE, 18"x8' Hendey, Tie-Bar, Q.C.G., T. A.
LATHE, 24"x20' American, Grd. Hd., Q.C.G., T.A.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd., Q.C.G., T.A.
LATHE, Turret 6W Acme, 3" H.S.
LAPPER, No. 1 Micrematic Hone (New)
MILLER, Duplex, 24" Cincinnati Auto.
MILLER, Plain, No. 1½B K&T, Dbl. O'arm.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati
MILLER, Univ. No. 1½ K & T, No. 3S Cinti.
MILLER, Univ. No. 3A Brown & Sharpe
SHAPERS, 24" Cincinnati, 28" G & E
SHAPER, Vert., 10" Pratt & Whitney

LANG MACHINERY COMPANY

28th St. & A.V.R.R., Pittsburgh, Pa.

LOOK THROUGH THIS LIST

BORING MACHINES

100" NBP Heavy Pattern mill (2)
96" Cincinnati "Massive Pattern" mill
60" Colburn mill
53" Niles Bement Pond mill
2¾" bar Lucas horizontal
5" bar Barrett cylinder borer
No. 112C Excello diamond borer
Munson double end borer
6 spdl. No. 10D Moline cylinder borer

RADIAL DRILLS

3', 9" Col. Cinc. Bick. Super Service
3' Western, Timken Bearing
3' Carlton sensitive
4' Hammond sensitive
4', 13" col. Carlton
5' Western

GRINDERS

No. 33 Excello thread grinder
No. 2 Cincinnati centerless
Nos. 72, 72A3, 75A Heald internal
6" x 18" Grand Rapids hydr. surface
Nos. 10 & 18 Blanchard surface
8" x 24", No. 78 Wil. & Morgan surf.
No. 2 Brown & Sharpe universal
3" x 12" No. 5 Brown & Sharpe
6"x18" Norton hydr. cylindrical
6"x18", No. 10 B. & S. elec. hydraulic
6"x18" Landis type hydraulic
7" x 11" Leach
10"x18" & 10"x50" Norton plain
10"x24", 16"x36" & 16"x72" Landis plain
1¾" to 5" Sellers drill grinder
No. 30 Willeys carbide tool

ENGINE LATHES

12" x 24" ctrs. Sebastian grd. hd.
14" x 6' Lebond late type
14"x6' Hendey grd. hd.
14" x 6' & 18" x 6' American grd. hd.
14" x 6' & 18" x 6' American cone
14" x 6' Mulliner
18" x 8' Springfield grd. hd.
36" x 16' Bridgeford geared head

MILLERS

Nos. 2B & 3B Kearney & Trecker plain
No. 3S Cincinnati plain
No. 3B Brown & Sharpe plain
No. 3B Kearney & Trecker vertical
No. 3 Reed Prentice vertical
No. 4 Cincinnati vertical
Nos. 4-36 & 4-48 Cincinnati Hydromatic
30"x48" Newton Rotary
30", 42" & 84" Ingersoll Rotary
Ingersoll planer type, various sizes
Type C Hall planetary thread
No. 4 Lees Bradner univ. thread
12" Cincinnati plain Mfg.
No. 32 Kempsmith Mfg.
4" Rice Barton double spline
Pratt & Whitney double spline
No. 1 Davis & Thompson drum duplex
Ingersoll drum type duplex

PLANERS

33"x33"x8' Cincinnati, 3 heads
30"x30"x12' Cleveland openside, 2 heads

SHAPERS

15" Potter & Johnston universal
16" Gould & Eberhardt (old style)
16" & 20" Gemco (New)
32" Morton draw cut

MISCELLANEOUS

Brake, No. 35 D. & K., box & pan
Buffer, No. 5 Mitchell electric
Hammer, 3000-lb. B. & S. bd. drop
Honer, No. H-1 Micromatic Hydrohoner
Honer, No. 211 Barnes vertical
Lapper, No. 10 U Norton
Pipe machine, 6" Bignall & Keeler
Press, No. 10 Bliss reducing
Riveter, No. 5½B High Speed
Sand Cutter, Cleveland Model F
Saw, No. 401 Campbell Cutamatic
Slotter, 16" Bement Miles
Welder, 90 KVA Fisher Body seam

SEND FOR COMPLETE LIST

MILES MACHINERY CO.

SAGINAW, MICH.

OVERHEAD CRANES

1-TON—Whiting 33' Span
Curtis 24' Span
1½-TON—Shepard Niles 25'6" Span
P & H 34' Span
2-TON—Louden 19'2" Span
Box 38'9" Span
Detroit 28' Span
3-TON—Shaw 33' Span
P & H 25' Span
Northern 22' Span
Manning, Maxwell, & Moore 48¾'
"Conco" 45' and 26'6" Spans
5-TON—Whiting 47'4" Span
38' 10½" Span D.C.
Northern 30'9" Span
Milwaukee 70' Span
Milwaukee 66'9" Span
Manning, Maxwell, & Moore 70' Span
Manning, Maxwell, & Moore 47'4" Span
Shaw 36' Span
Champion 37'6" Span
American 76' Span
American 47'4" Span
6-TON P & H 77' Span
American 77' Span
7½-TON—Shepard 36' Span
10-TON—Shaw 68' Span
Shaw 73' Span
P & H 39' Span
P & H 87'6" Span
P & H 80' Span
Northern 71'10½" Span
Northern 60' Span
Morgan 55'8" Span
Morgan 39'5" Span
Morgan 52'3" Span
Milwaukee 66'9" Span
McGill 85' Span
Lane 60' Span
Emsee 75' Span
Dominion 35' Span
Cleveland 38½" Span
Cleveland 50' Span
Alliance 71'10½" Span
Alliance 58'9" Span
Albany 60' Span
15-TON—Whiting 71'-10½" Span
Northern 53' Span
Erie 60' Span
Chesapeake 55'0" Span
Case 51' Span
20-TON—Shepard Niles 49'6" Span
P & H 51'4" Span
Northern 60' Span
Morgan 60' Span
Cleveland 65' Span
25-TON—Whiting 100' Span
Tysaman 60' Span
P & H 70' Span
Morgan 52'3" Span
Cleveland 106' Span
Case 63' Span
Bedford 56' Span
30-TON—Whiting 80' Span
P & H 80' Span
P & H 60' Span
Morgan 30' Span
Case 41' Span
35-TON—Bedford 50' Span
Northern 22' Span
50-TON—Shaw 95' Span
Shaw 69'10" Span
Dominion 80' Span
Cleveland 71'10½" Span
75-TON—Morgan 59'2½" Span
Alliance 78' Span
Alliance 37' Span
80-TON—American 40'6" Span
125-TON—Morgan 100' Span
150-TON—Whiting 50' Span
175-TON—Morgan 54' Span
200-TON—Alliance 100' Span

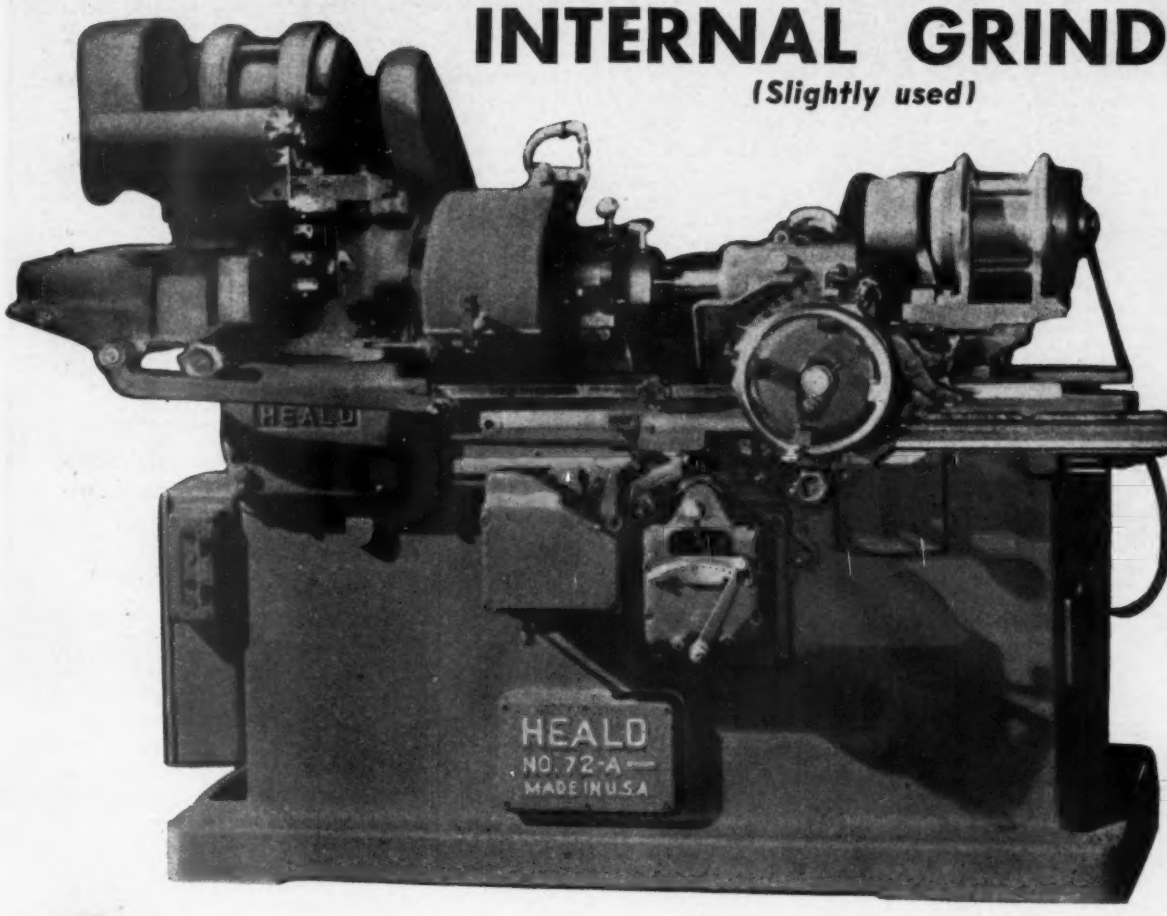
Telephone us collect to discuss your requirements.

ECONOMY COMPANY, Inc.

49 Vanderbilt Avenue New York 17, N. Y.
Tel. MUrrayhill 4-2294, 4-2893, 4-2295, 4-2844, 4-2296, 4-8292

AT OUR PRICES YOU CAN AFFORD A ..... HEALD INTERNAL GRINDER

(Slightly used)



SIZEMATICS
#72A3—#72

GAGEMATICS
#72A3—#72A

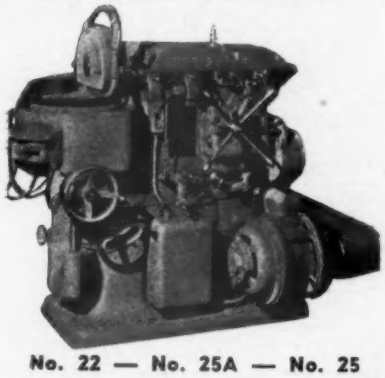
LONG BASE
#72A5

AIRPLANE
CYLINDER
#72

PLAIN
INTERNAL
#70A—#60

Heald No. 22 Rotary Surface Grinder

● Do you want fine finish, close limits, low loss on your grinding jobs? Here are HEALD grinders to fit almost every job in shop, tool room or production line and turn out top quality results. You get EXTRA profits too from these machines because at our prices it costs less to own a HEALD. Tell us what Heald Grinder you want in your shop. Our machines are complete, ready to go, available from stock—NOW! Ask us for specifications.



No. 22 — No. 25A — No. 25

HEALD ROTARY SURFACE GRINDERS

For that ultra fine finish job here are the grinders to do it. Simple to operate. Ideal for miscellaneous production job such as piston rings, collars, dies, discs, reamer blades and many other jobs. The machines offered are equipped with motors and ready to go. No extras to buy.

EMERMAN MACHINERY CORP.

875 W. 120TH STREET CHICAGO 43, ILLINOIS

QUALITY *Machine Tools*

NOW IN STOCK

No. 2H Kearney & Trecker Milwaukee Plain Milling Machine, double overarm, Timken spindle, No. 50 National taper, motor in base. New in 1943.

No. 36 Van Norman Plain Milling Machine, swivel head type, with No. 50 National Taper in spindle, Timken bearings, motor driven. New in 1942.

AUTOMATICS

1¼" Cone, eight spindle. New 1942.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.
No. 00, 0, 2G Brown & Sharpe.

DRILLS

4 Ft. Carlton Radial Drill, enc. head.
★ **6 ft. American Radial, enclosed head.**
No. D2 Colburn, single spindle.
42" Cincinnati Bickford.
Allen Sensitive Drill, four spindle.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".**
Pratt & Whitney Gun Barrel Drill.
LeBlond Gun Barrel Drill.

GEAR CUTTERS

No. 12 Barber Colman Gear Hobber.
No. 6, 61 Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
6" Gleason Str. Bevel Gear Generator.

GRINDERS

36" x 168" Mattison Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
No. 70 and 75 Heald Internal Grinders.
10"x24" Norton Cylindrical Grinder.
10" x 72" Norton Cylindrical Grinder.
8"x24" Thompson Surface Grinder.
No. 2 Cincinnati Centerless Grinder.
★ **No. 3 Cincinnati Centerless Grinder.**
No. 3 Cincinnati Universal Grinder.

LATHES, ENGINE

★ **12"x30" Monarch Model C Tool Room.**
14" x 6' Sebastian, motor in base.
16"x6' Hendey, g.h.
48" x 12' Lodge & Shipley, C.D.
No. 12 Gisholt Hyd. Lathe.
LR Lo-Swing Lathe, m.d., new in 1940.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET

No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bearing, new 1942.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

MILLS

No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Universal, s.p.d.
No. 4 Cin. Plain, Rect. Overarm.
No. 2-MH Cincinnati Plain, m.d.
★ **No. 4H Milwaukee, Double Overarm, motor in base, new 1940.**
No. 2H Milwaukee Vert., motor in base.
No. 0-8 Cincinnati Plain Automatic, m.d.
★ **18" Cin. Plain Mfg., m.d., new 1943.**
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.
4" Pratt & Whitney Spline Mill.

MISCELLANEOUS

No. 17 Greenerd Arbor Press.
2500 Ton Lake Erie Forming Press.
Reliance Sand Blast No. 193A.
No. 100 Micromatic Hydrohoner.
Schraner Crankshaft Lap. Mach., Mod. B.
8" x 7" Troy Vertical Steam Engine.
Gray Nibbler, ⅜" capacity.

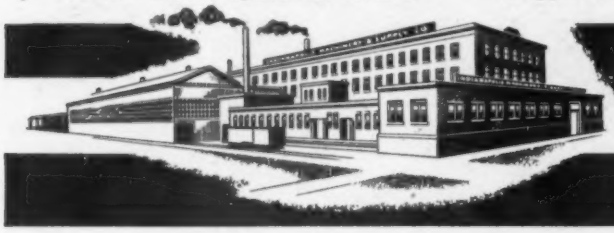
PLANERS AND SHAPERS

16" Gould & Eberhardt, s.p.d.
★ **6" Pratt & Whitney Vertical Shaper.**
38" x 38" x 14' Ohio Planer.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. motor drive.

SAWS

9" x 9" Peerless, Hydraulic.

(Approved Dealer for War Assets Administration Surplus Machines)



INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1961 S. Meridian St., Indianapolis 6, Indiana

EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK

MEXICO OFFICE: *Avenida Independencia No. 368, MEXICO, D. F.*

OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 9/16" x ⅞" Model G
AUTOMATICS, Cone, 1¼", & 2⅝" 4 spdle.
AUTOMATICS, Gridley, 1¼, 1⅝, 2¼", & 2⅝ Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" M.D.
AUTOMATICS, Cleveland 1¼, 1½, 2, 2½, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
#11 Polymatic Form & Cutoff
#1 Wickman Swiss Type, used very little
CLEVELAND 3½" Model K-4 M.D.
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
CONOMATICS, 1½ & 1⅝—8 spindle, M.D.
DRILLS, High Speed B. B. 1 to 6 spindles
GEAR HOBBERS, #3 Barber-Colman, M.D.
GEAR SHAPERS, #6 Fellows, M.D.
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72A Hydraulic, 2 M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18" M.D.
LATHES, Hendey, E.B.M. type, 14"x7' M. D.
LATHES, Hendey, 16"x6' M.D.
LATHES, Hendey, 24"x10' G.H. M.D.
LATHES, Rockford, 16"x8' Geared Head, M.D.
LATHES, Turret Warner & Swasey #4 G.H.,M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
MILLING MACHINES, Reed-Prentice #2V Vert.
MILLING MACHINES, Milwaukee #1B Universal #2, 2B Plain, M.D.
PLANER, Gray 36"x36"x12' two rail Hds.
PLANER, Ohio 42"x42"x10' One Head, M.D.
Thread Roller, Watson-Flagg. Late type—3/16" to 2½" cap.

OTT MACHINERY SALES, INC.

542 Second Avenue
Detroit 26, Mich.

MONA MEMBER

UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drill, 21" Royersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt, motor driven
Drills—New— 18" Royal Motor driven (10)
Gear cuter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe. Quick Change Gear
Magic Chucks, #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer 24"x24"x8' Pease, motor drive
Pnunch & Shear, two ½" & ⅞" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathes, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

LATEST MODELS

No. RD1175J Walker Turner Radials, M.D. (4)
4'9" Cincinnati Bickford Radials (1942) (2)
3'11" American "HOLE WIZARD" Radial (1942)
3'11" Morris "MOR-SPEED" Radial (1942)
7'17" Fosdick Radial (1942)
8'19" Cincinnati Bickford Radial (1942)
24" Bullard Vert. Turret Lathe, Spiral Drive
72" King Vert. Bor. Mill, Side Head (1942)
#340-F Giddings & Lewis Mill (1942)
No. 1H-12 Kearney & Trecker Mfg. Miller (1941)
No. 5H Kearney & Trecker Pl. Miller (1941)
No. 0 Brown & Sharpe Wire Feed (3)
No. 2 Warner & Swasey Gd. Hd. Timken Brg.
No. 3 Warner & Swasey Univ. Turret, Timken (1941)
No. 1A Warner & Swasey Turret, Timken (3) (1941)
No. 2A Warner & Swasey Turret, Timken (2) (1941)
10"x36" Hill-Clarke (Norton) Grinder, M.D.
No. 72A3 Heald Grinder, M.D.
No. 18 Blanchards, 30" Chucks, 220/440 (1941) (4)
No. 725A Fellows Gear Shapers (1940)
9" Pratt & Whitney Gear Grinder
No. 4T Sellers Tool Grinder (never Used)
6"x18" Thompson Type "F" Grinder (1941)
4"x12" Landis Type C Plain Grinder, (1942)
14"x168" Norton Type C Plain Grinder, M.D. (1942)
42"x132" Centers American Lathe, M.D. (1942)
50"x17' Centers LeBLOND Lathe, M.D. (1942)
No. 4½ Bliss S.S. Three Crank Press, M.D. (1942)
No. 6 Bliss S.S. Three Crank Press, M.D. (1942)

Wigglesworth Machinery Co.

203 Bent St. Cambridge, Mass.

H. & J. 8 ROLL

Plate Straightening Machine
Cap. ½" x 72", M. D.

AARON MACHINERY CO., INC.
45 Crosby Street New York, N. Y.

Boring Mills, 36"-42"-52"-72"-96".
Belt Cutters, 1"-1½"-2"-2½" Acme Landis
Lathe, Turret 3-A W. & S. S.P.D.
Press, Forging 1000 Ton United St. Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Planer, O. S. 60"x60"x14' D. & H. M.D.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut

West Penn Machinery Company

1210 Heuse Bldg. Pittsburgh, Pa.

NEW—USED
MACHINERY
and EQUIPMENT

LARGE STOCK ON HAND

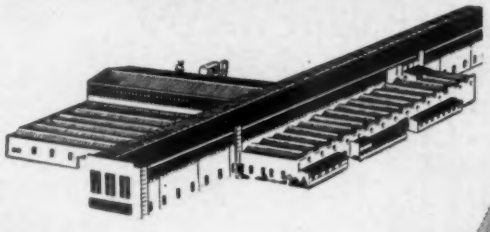
Hasco MACHINERY COMPANY
661-671 FRELINGHUYSEN AVE.
NEWARK 5, N. J. BIGELOW 3-2484-78

No. 2 Kempsmith Plain Maxi-Mill
No. 2 Brown & Sharpe Surface Grinder, M.D.
14"x8' Hendey Geared Head Lathe.

MONA MEMBER

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N.Y.



Eastern RECOGNIZED FOR DEPENDABILITY

★ During our forty years in business, Eastern has built an outstanding reputation for dependability. The men who buy machine tools . . . and those who use them, know that an Eastern Rebuilt Machine Tool is unconditionally guaranteed to meet the manufacturer's original "performance under power" tests. You get only good machines . . . reconditioned by master craftsmen in the heart of the machine tool industry.

Buyer's-eye view of the warehouse
Average stock — 1500 machines

CROSS SECTION OF OUR STOCK . . READY FOR IMMEDIATE SHIPMENT

★ INTERNAL GRINDERS

No. 16A—16" Bryant, m.d., latest
No. 16—22" Bryant Hydraulic Hole, m.d., latest
No. 16RS Bryant, m.d., latest
No. 6, 10, 20 Bryant, belt
No. 9 Cincinnati, belt
No. 24—21" Bryant Hydraulic Hole, m.d.
No. 72A Heald Plain, 3 m.d.
No. 72A3 Heald Sizematic, 3 m.d.
No. 72A3 Heald Gagematic, m.d.
No. 74 Heald, m.d., latest type

★ ROLLS

No. 4 Hilles & Jones Straightening Rolls, m.d., cap. 1" plate 8' long
32' Model No. 30 Bertsch Bending Rolls, m.d., cap. 7/8" x 30' plate

★ SHEET METAL MACHINERY

Southwark Rotary Metal Cutter, 36" throat, 3/8"
Niles-Bement-Pond Flanger, 8', hand power
No. 2 Campbell Nibbler, m.d., 12" throat
Quickwork Rolling Machine, 20" throat, 18 ga.

★ UNIVERSAL CYLINDRICAL GRINDERS

No. 13 Brown & Sharpe, m.d., latest
No. 2—12 x 30" Brown & Sharpe, belt
16 x 68" Landis, belt
12 x 30" Landis Hydraulic, m.d., latest
12 x 36" Cincinnati, belt

★ TAPPERS

No. 1 Garvin, belt
1/2" Rickert & Shaffer, belt
No. 5 Webster & Perks 5 spindle Vertical Nut, belt
6 spindle 1/2" Acme Semi-Automatic Nut, m.d.

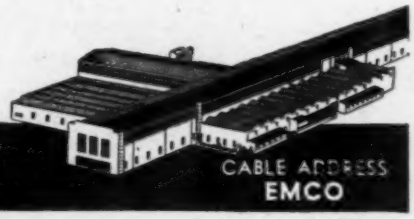
★ ENGINE LATHES

12" x 6' Hendey Geared Head, m.d., taper
14" x 8' Pratt & Whitney, cone
18" x 7' Hendey Geared Head, m.d., taper
20" x 8' Springfield Geared Head, m.d., taper
23" x 12' LeBlond Geared Head, m.d., taper
24" x 72" centers Lodge & Shipley Selec. Head, m.d. in base, taper, latest
24" raised to 28" x 10' Hendey Geared Head, m.d.
27" x 16' LeBlond, cone, taper
36" x 12' Lodge & Shipley Selec. Head, m.d.
36"x12' Wright, cone
36"x28'6" Niles m.d., p.r.t., taper, latest
36" x 30' Lodge & Shipley Selec. Head, m.d.

★ TURRET LATHES AND SCREW MACHINES

No. 1A Warner & Swasey, m.d., Timken bar, latest
No. 1 Cincinnati Acme Semi-Universal, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., bar
No. 2 Cincinnati Acme Full Universal, m.d., chucking, latest
No. 2 Pratt & Whitney Shaver, m.d.
No. 3A Warner & Swasey Universal, m.d., bar, latest
No. 4 Gisholt Universal, m.d., chucking
No. 4 Warner & Swasey Geared Head Universal, m.d.
No. 7 Bardons & Oliver Universal Ram Type, m.d., chucking
2 1/2 x 24" Jones & Lamson Geared Head, m.d., bar
3 1/4" Cincinnati Acme Geared Head, m.d., chucking
20" Cincinnati Acme Flat Turret, m.d.
24" Gisholt, cone

The above is only a partial listing. Whatever you need in metal working equipment, call on Eastern

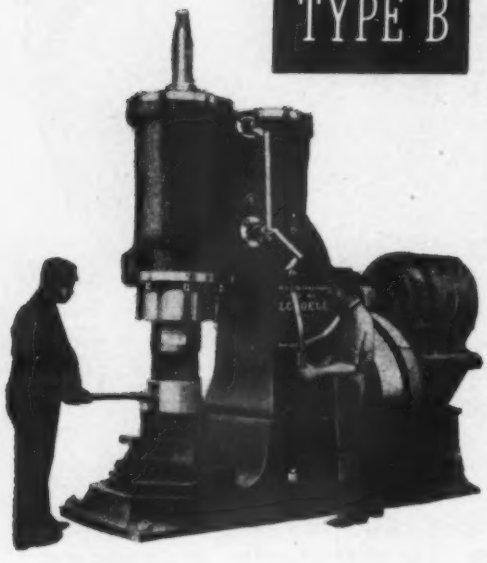


THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241
CABLE ADDRESS EMCO

AVAILABLE for PROMPT SHIPMENT

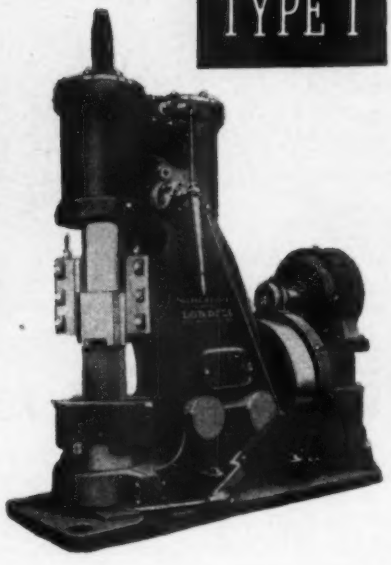
LOBDELL NAZEL HAMMERS!

TYPE B



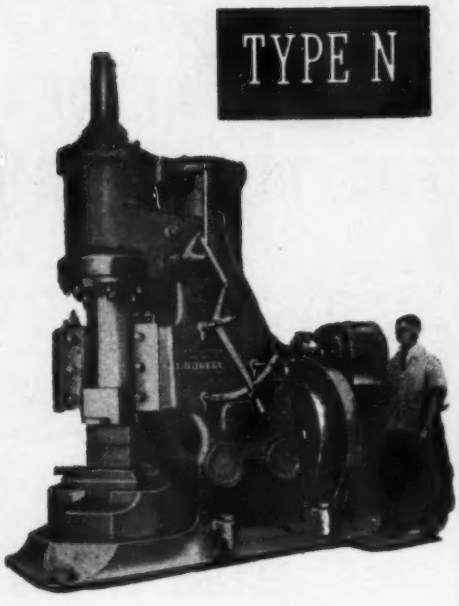
	No. 6
Mild Steel Worked Efficiently	7" square
Blows per Minute	120
Maximum Horsepower Required	34.4
Requisite Motor (Horsepower)	40
Desirable Motor Speed ..... R.P.M.	900
Stroke of Ram ..... inches	27¾
Distance from Center of Ram to Housing ..... inches	20¼
Distance Between Dies, Clear Working Space ..... inches	25
Ram Die Surface, Regular .... inches	5x12
Floor Space Required ..... inches	118x47
Weight of Hammer Without Anvil ..... pounds	21500
Weight of Anvil With Die Holder and Die ..... pounds	12200
Total Weight, Approximately ..... pounds	33700

TYPE I



	No. 6
Blows per Minute	120
Clear Space Between Guides ..... inches	13
Requisite Motor (Horsepower) ..	40
Desirable Motor Speed .... R.P.M.	900
Stroke of Ram ..... inches	23½
Distance from Center of Ram to Housing ..... inches	20½
Ram Die Surface, Limit .... inches	13x13½
Floor Space Required ..... inches	44x120
Total Weight, Approximately ..... pounds	36000

TYPE N

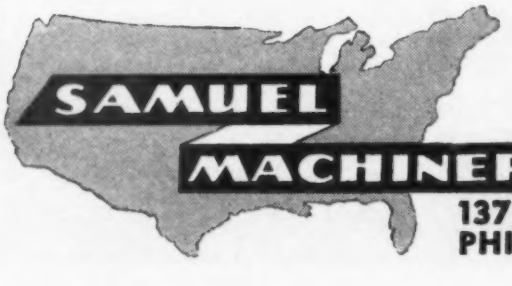


	No. 6
Mild Steel Worked Efficiently ..... inches	7x7
Blows per Minute	120
Clear Space Between Guides .. inches	13
Requisite Motor (Horsepower)	40
Desirable Motor Speed ..... R.P.M.	900
Stroke of Ram ..... inches	23½
Distance from Center of Ram to Housing ..... inches	20½
Ram Die Surface, Regular .... inches	5x12
Floor Space Required ..... inches	44x120
Total Weight, Approximately ..... pounds	35000

Machines Are Equipped with Three Phase, 60 Cycle, 220/440 Volt Electrical Equipment

NUMEROUS OTHER TYPES OF MACHINE TOOLS IN STOCK

YOUR INQUIRIES ARE INVITED



SAMUEL MACHINERY COMPANY

More than 50 YEARS of Real Service

137 North Third Street Market-
PHILADELPHIA 6, PA. 7-6100

SIMMONS CURRENT ATTRACTIONS

BORING MILLS

9" Bar BETTS Horizontal floor type, 50" face plate, 8'—vertical travel, modern, 4-motors.

3" & 4½" Bar Universal TRI-WAY Horizontal Boring Mill, P.R.T.
No. 32 LUCAS 3¾" Bar, M.D.
No. 35 LANDIS Horizontal floor type, 3½" Bar.
52" KING Two Swivel Heads, All-Geared.
96" CINCINNATI, 2 swivel heads.
100" N.B.P. Vert. 2-swiveling heads, P.R.T.
12' BETTS Heavy, Double Drive.
14-20' N.B.P. Extension type boring—2 swivel heads, all geared feeds, AC or DC, M.D.
No. 1 PUTNAM car wheel Borer.

MILLERS

24"x24"x16' INGERSOLL Planer type.
No. 2 KEMPSMITH Universal Maximiller.
#4-B B & S Double overarm.
Nos. 2 and 4 CINCINNATI High Power Vertical, Power rapid traverse.
No. 5 CINCINNATI Plain Rectangular overarm table 83"x21".
No. 3-36 CINCINNATI Duplex Hydromatic
6"x14" PRATT & WHITNEY, thread.

LATHES

30"x14' AMERICAN, 12 speed, G.H.
36"x24' N.B.P. "Timesaver".
PUTNAM Double Axle Lathe, G.H.
30"x34' LEBLOND Gun Boring.
42" PUTNAM Car Wheel Lathe, G.H.
48"x70' N.B.P. Engine Lathe.
48"x30' SIMMONS, Geared head.
60"x30' Centers MACKINTOSH-HEMPHILL Heavy Duty Geared Head M.D. (Built 1942).
60"x30' Centers N.B.P. Heavy Duty Geared Head, M.D. (Built 1942).
60"x40' Centers MACKINTOSH-HEMPHILL Heavy Duty Geared Head M.D. (Built 1942).
79" N.B.P. loco, driving wheel lathe.
90" PUTNAM Driving Wheel Lathe with journal truing and Double Quartering attachment.
No. 2-H LIBBY, Full Universal Cross Feeding Turret, Taper Attachment, M.D.

DRILLS

8' AMERICAN Triple Purpose Radial.
No. 310 BAKER, high speed.
No. 314 BAKER, high speed.

GRINDERS

No. 2 CINCINNATI centerless grinder.
24"x20' Centers NORTON Plain. Cylindrical individual motor drive to work spindle, wheel spindle and table.
No. 70 HEALD Internal.

GEAR HOBBERS

No. 5 Pfauter, spur, helical and worm, 130" dia. capacity.

100" GOULD-EBERHARDT, Horizontal, for spur, helical and worm gears, capacity diameter 101" face 48".

PLANERS

48"x48"x32' GRAY Spiral Drive, four heads, 230 volts, D. C.
77"x72"x15' N.B.P. 4 Hds, 230-volt D.C.

14'x9'x35' Capacity Detrick & Harvey Convertible openside, 2 rail heads, 2 side heads, traveling outer support, 230 V.D.C.

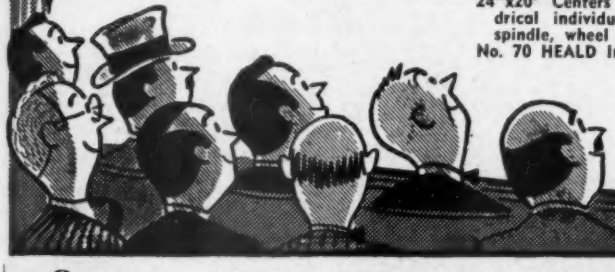
60"x60"x18' CLEVELAND Openside.
84"x60"x18' DETRICK-HARVEY Convertible Openside, 230-volt, D.C.
120"x96"x20' CINCINNATI Rapid Traverse, 230 volt, D.C. reversing type planer motor and control, 4 heads.

SHAPERS—SLOTTERS

6" & 10" PRATT & WHITNEY Vertical.
15" BETTS Heavy Slotter.
18" NILES-BEMENT-POND Heavy Slotter.
21" NILES-BEMENT-POND Slotter, M.D.
36" MORTON Drawcut, Rotating Arbor, Geared Feeds, P.R.T., M.D.

MISCELLANEOUS

1½"x1½" CLEVELAND Punch, 42" throat, Style "G".
30"x⅞" NILES-BEMENT-POND Bending Rolls, pyramid type
No. 2 PRATT & WHITNEY Jig Borer with 22"x44" table.
60" NEWTON Cold Saw, M.D.
No. 55 NEWARK Spur Gear Cutter.
60" CINCINNATI Spur Gear Cutter.



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LATE TYPE — Approximately 3 to 4 years old
EXCELLENT CONDITION

DRILLS

3' 9" Morris Radial
3' 11" American "Hole Wizard" Radial
3' 9" Cinc.-Bick. 18-speed Radial
3½' Western Radial

GRINDERS

Abrasive #5—14x14x48—Surface
Reid #2C Hand Opr.—motorized spdle.

LATHES

14½"x6' o. Bend #183C
16"x54" Reed Prentice Model AA
Warner and Swasey #5 Universal Turret

MILLING MACHINES

B & S #1 Plain Light Type Horiz.
Van Norman #2LP Plain Horiz.
K & T "Milwaukee" #2H Plain Horiz.
K & T "Milwaukee" #2K Plain Horiz. (2)
B & S #2 Vertical—light type
Van Norman #3V Vertical

SHAPER

28" Gould and Eberh.—Industrial

OTHER DESIRABLE MACHINES

DRILL, 4'-11" Cinc. Bickford—Radial—GB—SPD
DRILL, 6'-15 Bickford
DRILL, 4' Western
DRILL, Multiple D5—Natco
DRILL, Cinc. 22" Upr. BG—PF
ENGRAVER, Gorton #1A
FOLDER, Pexto 48", leaf type
GRINDER, B & S #11 Cyl.—plain
GRINDER, Norton 10x24 Cam
HAMMER, Bliss 300# Board Drop
LATHE, 30"x8' Lodge and Shipley—GH—QCG
LATHE, 14"x6' American—GH—QCG
LATHE, 24"x10 Blaisdell—LCG
MILLER, Van Norman #2 Duplex
MILLER, Cincinnati 12" BG
MILLER, P & J #2M Dual table
MILLER, Cinc. 24" Duplex
MILLER, Atlas—MFG—Bench
PRESS, 135-ton V&O 6¼—26—SS—14" str.
PRESS, 100-ton Perkins—91—SS—4½" str.
PRESS, W.F.—Double Action—8-ton
SHAPER, 16" G & E 4-speed dr.—M.D.
SHAPER, 16" American—C.D.
SHAPER, 7" Logan—New
TAPPER, Garvin #2

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& TOOL CORPORATION

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Pract. new 4' CINCINNATI-GILBERT, 11" Col. motor on arm.
Pract. new 6' CARLETON, motor on arm—9½" col.
3' MORRIS, motor on arm, 9½" col.
3' AMER., motor on arm, 9" col.
2½" AMER., #4 M.T. 9" col.

Pract. new 3" GLEASON GEAR GENERATOR, New in 1942.

GRINDERS

6x18" Type C LANDIS HYDRAULIC CYLINDRICAL New 1941, 2⅜"x18" Grinding wheel, M.D.
No. 5 BRYANT INTERNAL, New 1937, Oil Pump, M.D., with motor and control (2)
No. 39 EXCELLO INTERNAL THREAD GRINDERS, New in 1942. M.D.
No. 2B B & S SURF., 6x18" table, B & S Mag. chuck, motor in base.
No. 2 NORTON UNIV. TOOL & CUTTER.

LATHES

Practically New Toolroom Lathes

12"x30" Model C MONARCH	22"x48" LODGE & SHIPLEY
16"x30" Model C MONARCH	20"x48" MONARCH

24"x10' SPRINGFIELD FLOOR LATHE, Grd. Hd. M.D.
20"x32" L & S FLOOR LATHE, Grd. Hd. Q.C.G., Motor in base.
16"x10' HENDEY FLOOR LATHE, Grd. Hd., Q.C.G., Mtr. in base, T. A.
16"x8' LEHMAN HYDRATROL, Grd. Hd., Q.C.G., Motor in base.
14"x32" LODGE & SHIPLEY, Grd. Hd., Q.C.G., Motor in base.
14"x54" REED PRENTICE MODEL B TOOL ROOM, T.A., chuck, M.D.
20"x25" FAY AUTOMATIC LATHES, M.D., Air chuck (4)
9" MODEL C SUNDSTRAND AUTO. PRODUCTION, New 1939, Air chuck, 11" swing, 43" length of bed, Coolant pump, M.D. (2)
No. 4-A W & S UNIV. TURRET LATHE, Grd. Hd., 8¼" hole, M.D. 24" chuck
No. 3-L GISHOLT TURRET LATHE, Timken Bearing Spindle, 6" hole, 26½" swing, A.C. motor in base, All grd. head, Power feed, Rapid traverse.

MILLING MACHINES

Pract. new No. 2-MH CINCINNATI PLAIN MILL, Grd. Hd., Timken bearings, Rapid traverse, 10½x52½" table; Motor in base. Dial feed.
Pract. new No. 2 VAN NORMAN PLAIN MILL, Grd. Head, Timken Bearing spindle, Rapid traverse, Motor in base; 12x50" table; Coolant pump.
No. 9-J GORTON VERTICAL MILL, Mtr. 10½x35" table, M.D.
No. 2 CINCI. VERT. MILL, Adj. head, A.C. Mtr. in base, 12x52" table, Dial type.
No. 2-K K & T VERT. Mtr. in base, Adj. Grd., H.D. Dial Type.
Pract. new 18" CINCINNATI PLAIN MFG. TYPE MILL, New 1941, Grd. Head, 7⅞"x26½" table; Coolant pump, M.D.
No. 36 DEVLIEG ELECTRIC TOOL PRODUCTION MILL, B. G., 15x66" table; A.C. motor in base; coolant pump.
Pract. new 4"x9" HANSON WHITNEY THREAD MILLS, New 1941, 33" bed, 9" bet. centers, Air chuck, Coolant pump, A.C. M.D. (3)
No. 9-U-3 NATCO 3-WAY HYDRAULIC DRILLING & BORING MACHINE, New 1942, 1¾" hole; each head, individually driven.
FOX HORIZONTAL HYDRAULIC BORING & DRILLING MACHINES, New 1941.
FOX VERTICAL HYDRAULIC BORING & DRILLING MACHINES, New 1940.

PLANERS

72"x56"x13½' CINCI., 4 heads M.D.
48"x40"x17' CINCI., 2 heads on rail.
48"x48"x10' GRAY, 2 heads on rail.

SCREW MACHINES

1" FOOTE BURT 6-SPINDLE SCREW MACHINE, M.D. New 1941.
⅞" 4-SPINDLE NEW BRITAIN, Threading Spindle, Late Type, with chip conveyer & reel, new 1938.
Pract. new ⅜" (CECO) AUTOMATIC SCREW MACHINE, New 1942.
1⅜" MODEL AA CLEVELAND SCREW MACHINES, Single Spindle M.D. (2)

No. 7A DOUGLAS VERTICAL SLOTTERS, 7" stroke M.D.

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#2KM Kearney & Trecker Vertical Miller
#18 Blanchard Grinder, 30" Chuck
6-spdl. 7½" Goss & DeLeeuw Chucking Machine
3'-11" Carlton Radial Drill
8" x 48" J. & L. Thread Grinder

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Abrasive No. 1½ Surface Grinders, M.D.
Racine 6x6" Hacksaws, M.D.
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10' Niles Vertical Boring Mill
80" dia. Table—Vee Drive
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B. & S. Nos. 1, 2, & 3 Univ.
B. & S. No. 13 Univ. & Tool.
Abrasive Nos. 33 & 34
Norton 6"x18" Hyd. Surface.
Norton 6"x10"x36" Surface.
Norton 15"x15"x72" Surface.
Norton 6x32, 10x24, 10x50 Plain.
B. & S. Nos. 10, 11, Plain; Nos. 1, 2, 3, Univ.
Bryant Nos. 3B, 5, 6, 12 Internal.
Heald No. 70-A, Internal.
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Cincinnati No. 1½ Tool & Cutter.
Norton No. 2 Tool & Cutter.
Cincinnati No. 2 & No. 3 Centerless.
Cincinnati No. 3 Centerless Lapper.
Fitchburg 36" Spline Grinder.
Blanchard No. 16—36".
P. & W. 14" Vert. B. B.
Excello #31 Thread Grinder.
Barber Colman No. 3 Hobbers & Grinder.

LATHES

American 16"x6'—G.H.
American 18"x12'—G.H.
Lodge & Shipley 20"x8', G.H.

MILLERS

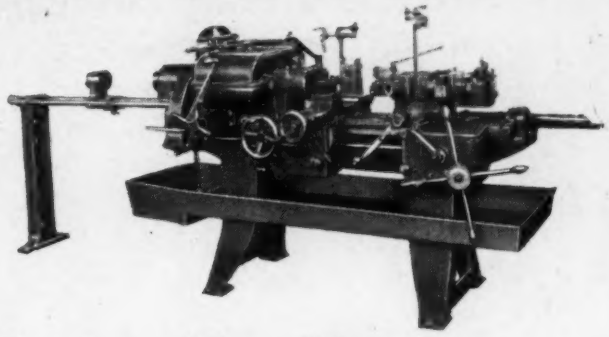
K. & T. No. 2H & 3H Plain.
B. & S. No. 0Y Production.
Cin. No. 2 Plain; Nos. 3, 4 Vert.
Becker Model C, Vertical.
Becker No. 7H, Plain.
B. & S. No. 3B & 5B Plain.
Rice-Barton 4" Spline.
P. & W. 8", 10" & 12" Automatic.
Cincinnati 18" & 24" Production.
Sundstrand No. 1-18 and No. 2 Electromil.
P. & W. 6x14 & 6x72 Thread.
Lees-Bradner 6"x36" Thread.

PLANERS

Cincinnati—48"x48"x20", 3 Head.
Powell 48"x48"x12", 4 Head.

SCREW MACHINES

B. & S. No. 00, 0, 2 Automatics.
B. & S. No. 1 & 2 Hand Screw.
Potter & Johnson No. 6-0 Chuckers.
Cleveland 1⅜" Model AA.
W. & S. Nos. 1, 2A, 3A Univ.
Foster No. 7 and No. 1B.
Cone 1¼" 4 Spindle.
Cleveland 3¼" Model A, Latest Type.
Cone 3½"—4 Spindle.
Cleveland 6⅜", Model A.
Cleveland 7¾", Model A.
Gridley ⅞", 1¼", 1½" and 2⅜". Model G.



Foster No. 1B Universal Turret Lathe

Swing over bed 15½". Swing over carriage slides 14". Auto. chuck cap. rd. 2"; sq. 1⅜"; hex. 1⅛". Dia. hole thru spindle 2⅛". Spindle speeds 20-480 R. P. M. Dia. of turret across flats 11"-size holes 2½". Center of holes to top of turret 2¼".

$750

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DENVER-ACME 6.2 TURRET LATHES (12)
LO-SWING AUTOMATIC 14"x32" and 5"x22"
MOREY TURRET LATHE #3 UNIVERSAL
LEES BRADNER THREAD MILLERS. No. 40 (3)
COULTER TYPE H, HOB THREAD MILLERS (5)
36"x14' INGERSOLL SLAB MILLER, 2 SIDE HEADS
KINGSBURY 8 STATION AUT. INDEXING DRILLING AND TAPPING MACHINE
CRONITE ROTO HYD. CUT OFF MACHINE

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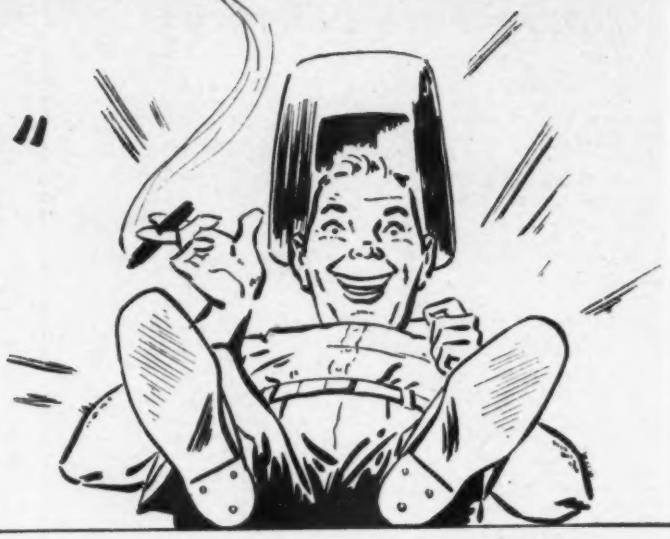

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☐ Electrodes and Welding Rods

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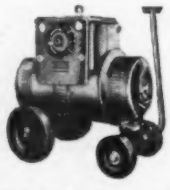

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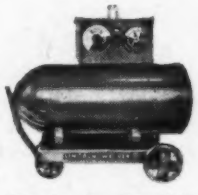

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157-7

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Boost Man-Hour Production . . . with Backstands!

Briefly, the backstand - abrasive-belt method increases grinding and finishing production per man-hour from two to four times over the old set-up wheel method. And abrasive belts are cheaper to use.

Simply stated, here are the reasons. First, the uniform, factory-coated belt is sharper, faster and smoother cutting. Second, the resilient work wheel provides a cushioned face which increases the area of abrasive contact. Third, the belt cutting surface is four times greater which means cooler cutting and longer life.

If you are now using set-up wheels or are planning a new grinding and finishing tool-up we invite you to write for our new "Case Studies" booklet which will permit you to reappraise your plant's man-hour production by the backstand-belt method.

BEHR-MANNING · TROY, N. Y.

(DIVISION OF NORTON COMPANY)

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Immediate Delivery

HIGH SPEED STEEL, STRAIGHT SHANK

TWIST DRILLS

EXTRA LENGTH

9" CUTTING FLUTES—12" LONG DRILLS

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
1/8"	12	9	$1.50	21/64"	12	9	$2.25
9/64"	12	9	1.50	11/32"	12	9	2.25
5/32"	12	9	1.50	23/64"	12	9	2.50
11/64"	12	9	1.50	3/8"	12	9	2.50
3/16"	12	9	1.50	25/64"	12	9	2.75
13/64"	12	9	1.60	13/32"	12	9	2.75
7/32"	12	9	1.60	27/64"	12	9	3.00
15/64"	12	9	1.75	7/16"	12	9	3.00
1/4"	12	9	1.75	29/64"	12	9	3.25
17/64"	12	9	1.85	15/32"	12	9	3.25
9/32"	12	9	1.85	31/64"	12	9	3.25
19/64"	12	9	2.00	1/2"	12	9	3.25
5/16"	12	9	2.00				

HIGH SPEED STEEL, TAPER SHANK

TWIST DRILLS

EXTRA LENGTH

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
17/32"	15	12	$6.50	27/32"	15	12	$11.50
9/16"	15	12	7.00	7/8"	15	12	12.00
19/32"	15	12	7.50	29/32"	15	12	12.50
5/8"	15	12	8.00	15/16"	15	12	13.00
21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1 1/8"	20	15	18.00
25/32"	15	12	9.50	1-3/16"	20	15	20.00
13/16"	15	12	11.00	1 1/4"	20	15	22.00

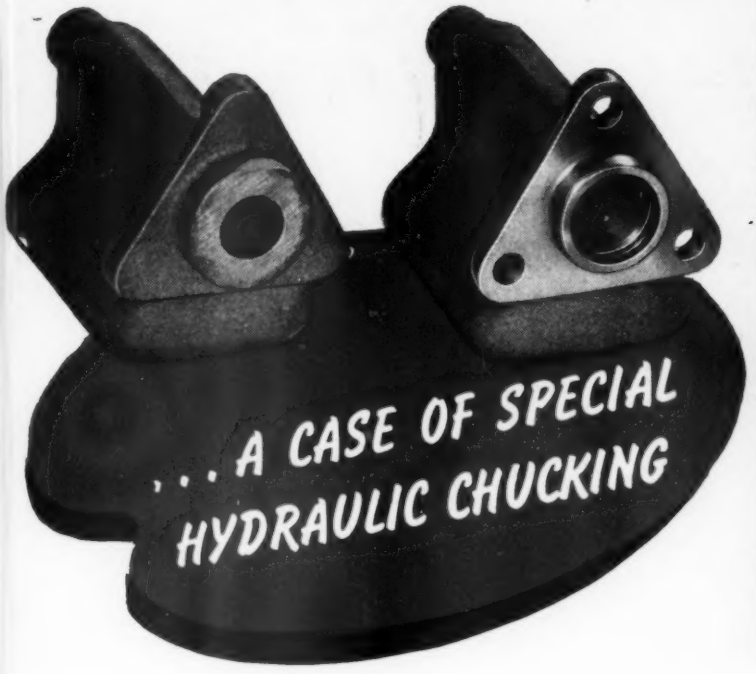
Victor Machinery Exchange

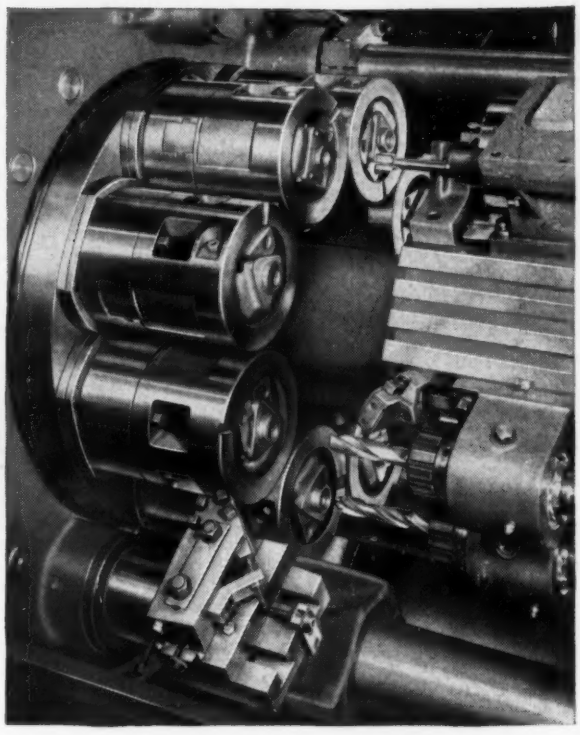
INC.

251 CENTRE STREET — NEW YORK 13, N. Y.

PHONE: CAnal 6-5575

LEADERSHIP BASED ON ACCOMPLISHED FACTS



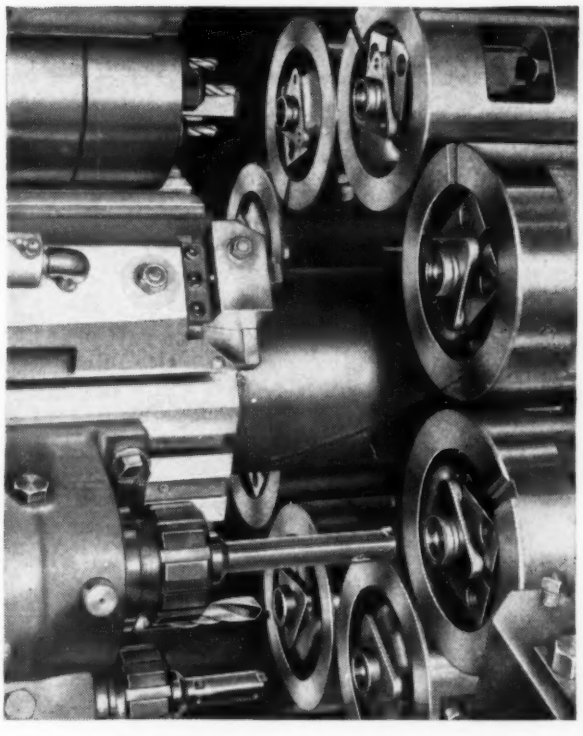


Entirely open end construction...
Loading position easily accessible

The master cylinder and supply tank illustrated above is manufactured by the Wagner Electric Corporation of St. Louis on a Model 88 New Britain eight spindle automatic work rotating chucking machine. The most difficult problem encountered in tooling this job was to synchronize the multiple drill head with the irregular shaped flange for accurate drilling of three mounting screw holes.

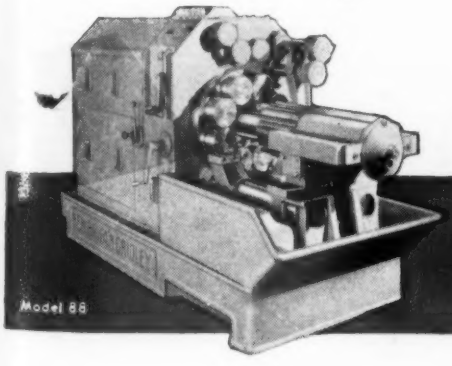
Our engineers developed a special hydraulically operated chucking fixture which positions the piece exactly the same at each chucking—permitting, with an ingenious locating device, proper synchronization of the drill head and the work. Otherwise the flange holes would have required a separate rehandling and a drill press operation with a resultant increase in the cost per piece.

Let our engineers help you to save extra operations in the machining of your work. Be sure to check with our field representatives or our home office about that new product you are designing or about better methods to machine your present products.



REAR VIEW: Note accessibility of all tools

★



NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

M-01040

— new savings await many manufacturers!

A thing can be so obvious it is easily overlooked. Like the advantage of making a tubular part from a seamless steel tube instead of a solid bar. Because the tube already has a hole in it, you eliminate drilling, reduce boring, hold scrap loss to a minimum, get the job done in a shorter time.

During the war and again in recent months, new advances have been made in piercing and finishing techniques, particularly in extremely thick-walled tubes. So today, many products produced by machine tools are being made faster, cheaper and better by taking advantage of the characteristics of Timken Seamless Steel Tubing.

We speak from unequalled experience because the Steel and Tube Division of The Timken Roller Bearing Company is one of the world's largest *producers* of Alloy Seamless Steel Tubing for mechanical uses and at the same time its Roller Bearing Division is the world's largest *user*.

Scores of ingenious applications are being made by the Timken Technical Staff. Challenge them to show you how Timken Seamless Steel Tubing might save you money and improve your product. The Timken Roller Bearing Company, Canton 6, Ohio. *Timken Bearings, Timken Alloy Steels and Seamless Tubes, Timken Removable Rock Bits.*

TIMKEN
Trade-mark Reg. U. S. Pat. Off.

Fine Alloy
STEEL AND SEAMLESS TUBES

WHOLLY A MATTER OF HOLES! Because piston pins in a Diesel engine take a terrific beating, they must be made from a very special steel. To machine them out of solid bars of this steel is tedious and expensive.

Production men in the plant of a prominent manufacturer who had wrestled with the problem, wondered if Timken Seamless Steel Tubing would supply the answer.

They consented to a trial; were astonished at the results.

Drilling, boring and turning operations were so reduced that *one machine* using Timken Seamless Steel Tubing equalled the output of *five* using bar stock.

Savings amounted to $100 per engine.

★ YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH